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Annotated catalogue of the types of Triphoridae (Mollusca, Gastropoda) in the Museum für Naturkunde, Berlin, with lectotype designations

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Abstract

Triphoridae is a family of marine caenogastropods with worldwide distribution. Its maximum diversity is in the Indo-Pacific province, where it is among the five most species-rich families. Taxonomic knowledge is scant and complicated by the high diversity and intra-specific variability. Knowledge of type specimens of described taxa is the fundamental first step for a taxonomic revision of the family. The Museum für Naturkunde hosts one of the most significant triphorid collections, which includes material described by W. Dunker, L. Pfeiffer, J. Thiele and E. von Martens. Type material of 29 species is described and illustrated; where appropriate, lectotypes have been designated to stabilize nomenclature. The specimens of one species, *Triforis delicatula* Thiele, do not fully match the original description and we refrain from selecting a lectotype, although we profusely illustrate them. Although not type material, specimens of *Triforis tricincta* Dunker have been included in this work to contribute to the knowledge on Dunker's species. For all species, the original descriptions in German or Latin are reported, with a full translation into English, and remarks have been added where appropriate.

Introduction

Triphoridae Gray, 1847 is a family of marine caenogastropods, whose adult shell ranges in size from 2 to 10 mm, but exceptionally reaches up to 50 mm. A characteristic feature of this family is that most species have a sinistral shell. Their maximum diversity and abundance extends from the intertidal zone to offshore in 200–500 m depth, and few species live in truly deep water below 1,000 m. Numerous anecdotal in situ observations (e.g., Lebour 1937, Marshall 1994, Poppe 2009) point to a close association with Porifera, but no specific study has been conducted on sponge-triphorid interactions. Triphorids are distributed world-wide, but the highest diversity is found in the tropical seas, and especially in the Indo-Pacific province, where they are regarded as one of the five most species-rich families (Bouchet et al. 2002). Taxonomically, the family is regarded as one of the most difficult among gastropods, because of the high number of species and the poorly understood intra- and inter-specific variability. Moreover, with few exceptions (e.g., Janssen 1993 for some Dunker's taxa; Higo et al. 1999 for some taxa described by Kosuge; Jay 2007 for Deshayes' and Jousseaume's taxa from Réunion Island) no published information is available on historical type material, which is often in bad condition (Bouchet and Strong 2010). Therefore, the thorough analysis of type material is a priority, especially in the perspective of describing the many new species which await a name: 70% of the 259 morphospecies segregated from the "Santo 2006" expedition to Vanuatu are supposed to be new to science (Albano et al. 2011). The most significant museum collections hosting triphorid type material are in the Natural History Mu-

seum of the United Kingdom (NHMUK), London, in the Muséum national d'Histoire naturelle (MNHN), Paris, in the Australian Museum (AM), Sydney, in the National Science Museum (NSMT), Tokyo, in the United States National Museum of Natural History (USNM), Washington, and in the Museum für Naturkunde (ZMB), Berlin. This paper aims to document all type material of Triphoridae housed in the Museum für Naturkunde as a first step towards a thorough revision of the family.

Methods

This work is based on an inventory carried out by the first author in the malacological collection of the Museum für Naturkunde. A catalogue of the whole collection, whether type material or not, has been compiled. This thorough analysis allowed the recognition of material unrecognized as type so far, such as syntypes of *Cerithium pusillum* Pfeiffer L., 1840. Also specimens belonging to species described by W.R. Dunker have been thoroughly analysed: some belong to described taxa (*T. fusca*, *T. tricincta*), while others bear a name which does not appear to have been formally introduced anywhere. The former have been included in this catalogue, even if not recognized as type material, while the latter belong to the long list of *nomina nuda* introduced on the basis of material provided by the Museum Godeffroy (Bieler and Petit 2012) and are not treated here.

In the catalogue below, the species name in its original combination is given, followed by bibliographic details of the original description. Lectotypes have been selected from syntypes in several cases to stabilize the nomenclature in the perspective of a full revision of the family. Lectotype designation follows the provisions of Art. 74 of the International Code of Zoological Nomenclature, 4th Edition. The type locality is given as stated in the original description, with the original orthography; the modern English name and geographic coordinates are provided. Depths were rarely reported in Thiele's original descriptions and were also gathered from Michaelsen and Hartmeyer (1907) for south-western Australian taxa, and from other monographs of the "Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition..." series. One special case is station 81 "Groβe Fischbucht" of the German Deep-sea Expedition, which is located off Baía dos Tigres in Angola. Samples from this location could, however, been mislabelled and refer to a sampling event in Agulhas Bank (Kilburn 1996). The coordinates of the station 100 are also reported differently: Thiele (1925: 6[40]) stated that its latitude is 34°38.9'S (for Fissuridea algoensis), but other volumes of the series on the German Deep-sea Expedition reported 34°8.9'S (e.g., the monograph on Gorgonaria, Kükenthal 1919). Original descriptions in the original language (German or Latin) are reported, with a full translation into English. A diagnosis is provided, focusing on the most significant diagnostic characters as discussed by Marshall (1983). These include chirality (sinistral, dextral), order of appearance of teleoconch spiral cords (in particular to separate species in which the second cord appears last versus those in which the first cord appears last), size, number of whorls (to discriminate species with planktotrophic from those with non-planktotrophic development) and sculpture (number of keels, spacing of axial riblets, microsculpture of first whorl) of the protoconch, shell profile (pupoid vs. narrowly elongated), colour of the teleoconch, number and sculpture of teleoconch spiral cords, and microsculpture between them; characters of the last adult whorl: number and sculpture of cords on base and behind outer lip, development and position of posterior siphonal canal/tube. Where appropriate, additional remarks are given. Species are listed in the text grouped by major biogeographical province, i.e.: Caribbean, South Africa, Indo-Pacific province, and Antarctica, to improve usability to readers. A taxon list in alphabetical order is provided in Table 1.

For each species, a plate has been mounted with both digital and SEM photos to illustrate the overall appearance of the species as well as details (e.g., peristome, apex, microsculpture). The holotype or lectotype is always illustrated, but often photos of paralectotypes or their details have been added. The original figure and

Table 1. List of treated taxa in alphabetic order, with original name, author and date, type locality and page and figure in this paper.

Taxon	Author and date	Type locality	Page, figure
adela, *Triphora*	Thiele, 1930	Shark Bay, Station 25 (-0.5/3.5 m), Western Australia	Page 19, Figure 12
aequatorialis, *Triphora*	Thiele, 1925	Off Zanzibar, East Africa Station 244 (5°55.8'S, 39°1.2'E, -50 m)	Page 21, Figure 13
aethiopica, *Triphora*	Thiele, 1925	Off Zanzibar, East Africa Station 244 (5°55.8'S, 39°1.2'E, -50 m)	Page 22, Figure 14
agulhasensis, *Triphora*	Thiele, 1925	Cape Agulhas, South Africa Station 95 (34°51'S, 19°37.8'E, -80 m)	Page 5, Figure 2
albina, *Triphora*	Thiele, 1930	Shark Bay, Station 1 (-7/8 m), Western Australia	Page 22, Figure 15
alboapicata, *Triphora*	Thiele, 1930	Shark Bay, Station 3 (-3 m), Western Australia	Page 23, Figure 16
algoensis, *Triphora*	Thiele, 1925	South Africa Stations 81 (16°26.5'S, 11°41.5'E), 95 (34°51'S, 19°37.8'E, -80 m), 100 (34°38.9'S, 24°59.3'E, -100 m), 101 (33°50.5'S, 25°48.8'E, -40 m)	Page 7, Figure 3

Taxon	Author and date	Type locality	Page, figure
brevis, *Triphora*	Thiele, 1925	Algoa Bay, South Africa 101 (33°50.5'S, 25°48.8'E, - 40 m)	Page 7, Figure 4
brunnescens, *Triphora*	Thiele, 1930	Shark Bay, Stations 16 (-11/12.5 m) and 20 (-0/3.5 m),Western Australia	Page 26, Figure 17
capensis, *Triphora*	Thiele, 1925	South Africa Stations 81 (16°26.5'S, 11°41.5'E), 95 (34°51'S, 19°37.8'E, -80 m), 100 (34°38.9'S, 24°59.3'E, -100 m), 101 (33°50.5'S, 25°48.8'E, -40 m)	Page 8, Figure 5
castaneofusca, *Triphora*	Thiele, 1930	Shark Bay, Station 3 (-3 m), Western Australia	Page 26, Figure 18
cingulata, *Triforis*	Dunker, 1860	Japan	Page 41, Figure 28
crassula, *Triforis*	Martens, 1880	Mauritius	Page 26, Figure 19
delicatula, *Triforis*	Thiele, 1912	Antarctica, -385 m	Page 44, Figure 31
dilecta, *Triphora*	Thiele, 1925	Cape Agulhas, South Africa Station 95 (34°51'S, 19°37.8'E, -80 m)	Page 10, Figure 6
dives, *Triphora*	Thiele, 1925	Off Zanzibar, East Africa Station 244 (5°55.8'S, 39°1.2'E, -50 m)	Page 30, Figure 20
elata, *Triphora*	Thiele, 1930	Shark Bay, Station 25 (-0.5/3.5 m), Western Australia	Page 30, Figure 21
erecta, *Triphora*	Thiele, 1925	Agulhas Bank, South Africa Station 104 (35°16'S, 22°26.7'E, -155 m)	Page 13, Figure 7
fusca, *Triforis*	Dunker, 1860	Japan	Page 26, Figure 22
fuscoapicata, *Metaxia*	Thiele, 1930	Shark Bay, Station 10 (-7/11 m), Western Australia	Page 32, Figure 23
ignobilis, *Triphora*	Thiele, 1925	Off Zanzibar, East Africa Station 244 (5°55.8'S, 39°1.2'E, -50 m)	Page 34, Figure 24
innocens, *Triphora*	Thiele, 1925	South Africa Stations 95 (34°51'S, 19°37.8'E, -80 m) and 106 (35°26.8'S, 20°56.2'E, -100 m)	Page 13, Figure 8
patricia, *Triphora*	Thiele, 1925	South Africa Stations 95 (34°51'S, 19°37.8'E, -80 m), 105 (35°29'S, 21°2.5'E, -102 m) and 106 (35°26.8'S, 20°56.2'E, -100 m)	Page 16, Figure 9
plebeja, *Triphora*	Thiele, 1925	South Africa Stations 100 (34°38.9'S, 24°59.3'E, -100 m), 101 (33°50.5'S, 25°48.8'E, -40 m) and 106 (35°26.8'S, 20°56.2'E, -100 m)	Page 16, Figure 10
pusillum, *Cerithium*	Pfeiffer, 1840	Cuba	Page 3, Figure 15
regia, *Triphora*	Thiele, 1925	Zanzibar Channel, East Africa Station 245 (5°27.9'S, 39°18.8'E, -463 m)	Page 36, Figure 25
sceptrum, *Triphora*	Thiele, 1925	Dar es Salaam, Tanzania, East Africa Station 242 (6°34.8'S, 39°35.5'E, -404 m)	Page 38, Figure 26
subulata, *Triphora*	Thiele, 1930	Shark Bay, Stations 1 (-7/8 m), 3 (-3 m), 9 (-3.5/11 m), 12 (-7/11 m), 14 (-11/16 m), 16 (-11/12.5 m) and 20 (-0/3.5 m), Western Australia	Page 38, Figure 27
superba, *Triphora*	Thiele, 1925	Agulhas Bank, South Africa Station 104 (35°16'S, 22°26.7'E, -155 m)	Page 18, Figure 11
tricincta, *Triforis*	Dunker, 1882	-	Page 41, Figure 28
tubifera, *Triphora*	Thiele, 1925	West Sumatra, Indonesia Station 193 (0°30.2' N, 97°59.7'E, -132 m)	Page 41, Figure 29
virginalis, *Triphora*	Thiele, 1925	Sumatra, Indonesia	Page 43, Figure 30

photos of the labels have been added as well. Specimens have been photographed with a Leica Z16-APO-A motorized microscope and DFC-490 camera, while SEM images have been taken without gold coating with a low vacuum ZEISS EVO-LS-10 microscope.

Abbreviations

NHMUK Natural History Museum of the United Kingdom, London
ZMB Museum für Naturkunde, Berlin
SMF Naturmuseum Senckenberg, Frankfurt.

Catalogue of type material of Triphoridae

Caribbean species

Cerithium pusillum Pfeiffer L., 1840

Figure 1
Cerithium pusillum L. Pfeiffer, 1840: 256, not illustrated.

Type specimens. Lectotype: ZMB/Moll no. 117874a, here designated. Paralectotype A: ZMB/Moll no. 117874b; further 49 paralectotypes (ZMB/Moll no. 117874).

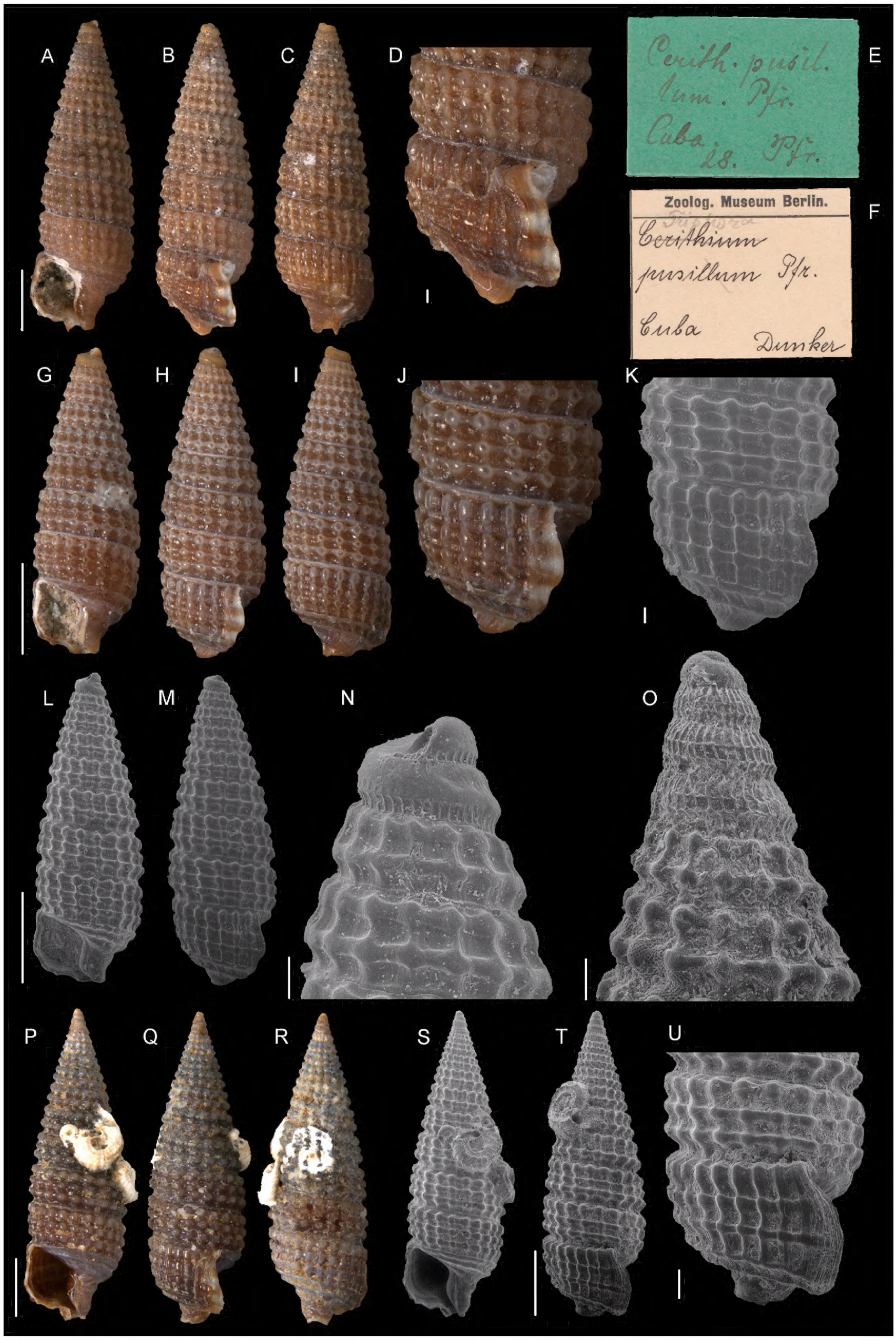

Figure 1. *Cerithium pusillum* Pfeiffer L., 1840. **A-D**. Lectotype, Cuba, ZMB/Moll no. 117874a: front (**A**), left side (**B**), back (**C**) and peristome (**D**). **E-F**. Original labels. **G-N**. Paralectotype A, Cuba, ZMB/Moll no. 117874b: front (**G, L**), left side (**H, M**), back (**I**) peristome (**J-K**), apex (**N**). **O-S**. *Cerithium pusillum* Pfeiffer, 1840. "Westindien", Dunker Collection, ZMB/Moll no. 117875a: front (**P, S**), side (**Q**), back (**R**) and apex (**O**). **T-U**. *Cerithium pusillum* Pfeiffer, 1840. "Westindien", Dunker Collection, ZMB/Moll no.117875b: side (**T**) and peristome (**U**). Scale bar: 1 mm, except **D**, **J-K**, **N-O**, **U**: 0.1 mm.

Type locality. Cuba.

Original description. *Testa sinistrorsa turrita tenui cinnamomea; anfract. 11 planis, sulcis longitudinalibus et transversis granuloso-decussatis; sutura profunda; canali brevissimo, vix recurvo; labro simplice, expanso. Long. 2½, diam. ¾ lin.*

Translation. A light brown sinistral shell composed of 11 flat whorls with tubercled spiral ribs. Deep suture. Siphonal canal very short, barely bent. Lip simple, expanded. Length 2.5 *linien ("lines")*, diameter 0.75 *linie* (L. Pfeiffer probably used the "Preussische Mass" widely used after 1816 until introduction of the metric system; a *linie* is equivalent to 2.179 mm).

Diagnosis. Lectotype height 5.2 mm, but shells up to 6 mm are present in the type material. Pupoid shape, with deep sutures. Teleconch of 7-9 whorls. Three granulated spiral cords present: the second appears later, in the second half of the spire. A smooth suprasutural cord also present. The last whorl has a fourth weakly tubercled spiral cord, and the base has further two smooth spiral cords. Peristome simple, without bifurcating cords. Multispiral apex of 4-5 whorls, the lower three with two spiral keels and axial riblets. Colour brown; lip white with brown bands.

Remarks. Rolán and Fernández-Garcés (2008) considered this taxon a *nomen dubium*. Indeed, L. Pfeiffer's type specimens were thought to be in the Cuming collection (NHMUK) or in the Dhorn collection in the Stettin Museum, which was totally destroyed during the II World War (Dance 1966). Rolán visited the NHMUK without reporting any material on this species (Rolán and Fernández-Garcés 2008). Pfeiffer did not illustrate the species, and the original description is very brief.

In the ZMB/Moll there are two lots of this species from the Dunker collection. The first lot is labelled *Cerithium pusillum* (Fig. 1, E) and composed of 51 mostly worn specimens from Cuba, and obtained from Pfeiffer ("Pfr." on label). This material is consistent with the original description. These specimens are therefore considered to belong to the type series. To stabilize nomenclature, the best preserved specimen is here designated as the lectotype (Fig. 1, A-D, ZMB/Moll no. 117874a). Among the 50 paralectotypes, another well preserved specimen was segregated as 'paralectotype A' and here illustrated (Fig. 1, G-M, ZMB/Moll no. 117874b). The second lot contains 13 far better preserved specimens labelled as coming from "Westindien" (= Western Indies) and also from the Dunker collection. They are clearly conspecific with *Cerithium pusillum*, and provide a useful addition for a better illustration of fine diagnostic characters (e.g. apex sculpture) but are not considered to be types.

South African species

***Triphora agulhasensis* Thiele, 1925**

Figure 2

Triphora agulhasensis Thiele, 1925: 128 (94), plate XXII (X), figure 17.

Type specimens. Lectotype: ZMB/Moll no. 109268a, here designated. Paralectotype A: ZMB/Moll no. 109268b.

Type locality. "Station 95 [Cap Agulhas]" (South Africa).

Original description. *Zwei Schalen von Station 95 sind der vorigen Art [*Triphora patricia*] zwar recht ähnlich, aber weniger schlank, die Kante der letzten Windung ist weniger scharf und darunter noch ein zweiter Reifen. Es sind etwa 9 Windungen vorhanden, deren erste wie bei der vorigen Art geformt und skulptiert sind, auch hier haben die folgenden 3 Körnerreihen und einen glatten Reifen. Dieser bildet bei der letzten Windung die untere Kante, die etwas stumpfwinklig ist, unter ihr sind noch 2 Reifen sichtbar. Spindelfortsatz mäßig lang, gerade, Mündung rautenförmig. Höhe 5 mm, Durchmesser 1,6 mm.*

Translation. Two shells from Station 95 are quite similar to the previous species [*Triphora patricia*], but less slender; the edge of the last whorl is less pronounced and even includes a second thread. There are about 9 whorls, which are initially shaped and sculptured as in the previous species, again having three rows of tubercles and a smooth thread. This forms on the last whorl an edge, which is somewhat obtuse, under this edge there are still two threads visible. Siphonal canal moderately long, straight; diamond-shaped aperture. Height 5 mm, diameter 1.6 mm.

Diagnosis. Lectotype height 4.8 mm. Shell weakly conical; teleoconch with 5-6 whorls with three tubercled spiral cords and a fourth suprasutural, smooth cord. Two further smooth spiral cords on the base. Simple peristome, without bifurcating cords. Paucispiral large apex of 2-3 whorls; the transition to teleoconch is difficult to spot. The first protoconch whorl is ornamented by three strong smooth spiral cords; the two lower cords develop strong granules on the second whorl. Colour white.

Remarks. The type lot contains three specimens. Two are conspecific and belong to *T. agulhasensis*; a third one has strong tubercles on the first protoconch whorl instead of the smooth keels in *T. agulhasensis*, and does not belong to this species.

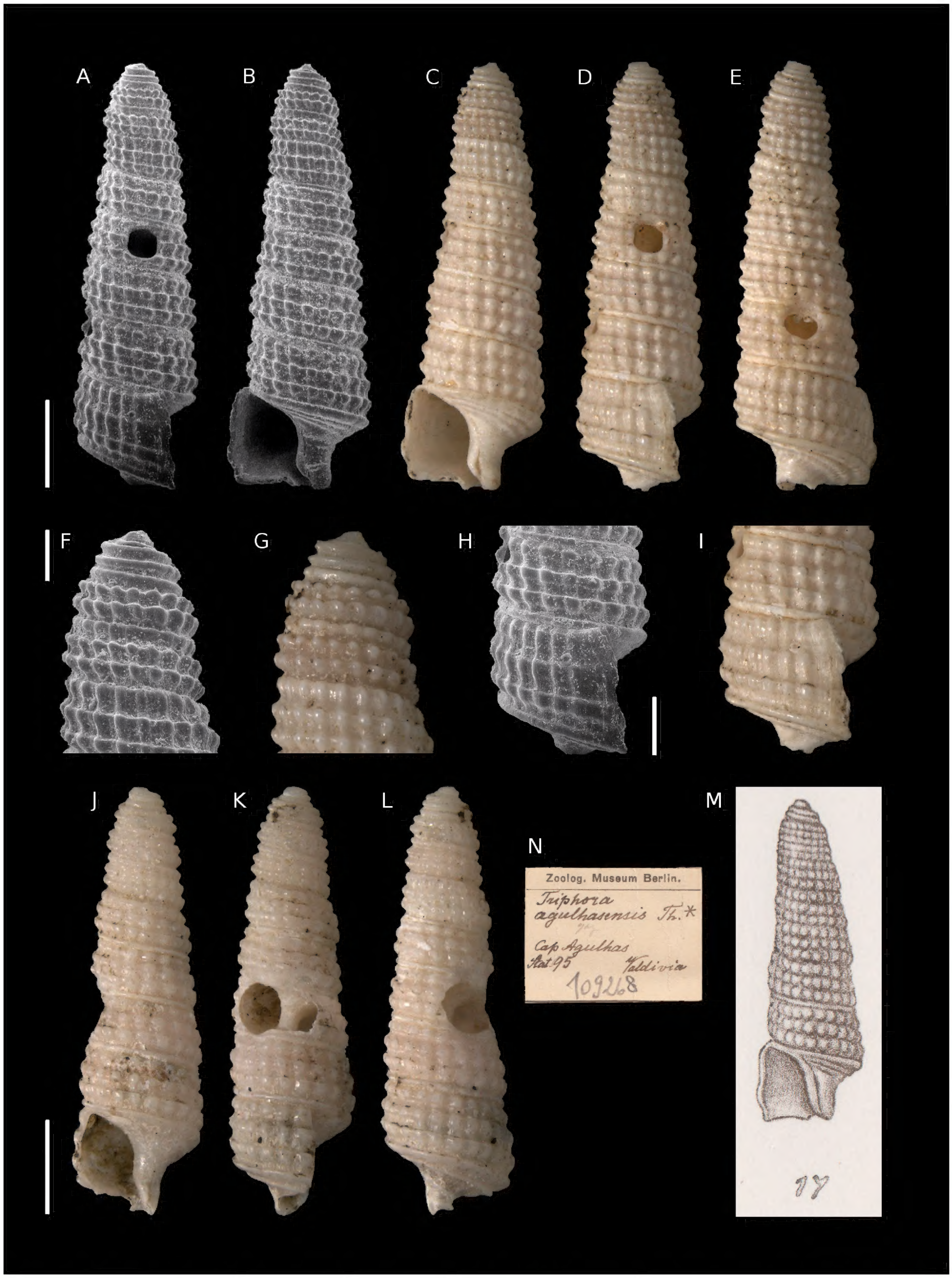

Figure 2. *Triphora agulhasensis* Thiele, 1925, Station 95 (Cape Agulhas). **A-I**. Lectotype, ZMB/Moll no. 109268a: left side (**A, D**), front (**B-C**), left side (**D**), back (**E**), protoconch (**F-G**), peristome (**H-I**). **J-L**. Paralectotype A, ZMB/Moll no.109268b: front (**J**), side (**K**), back (**L**). **M**. Original figure in Thiele 1925. **N**. Original label. Scale bar: **A-E**: 1 mm, **F-G**: 0.3 mm, **H-I**: 0.5 mm, **J-L**: 1 mm.

Triphora algoensis Thiele, 1925

Figure 3

Triphora algoensis Thiele, 1925: 128-129 (94-95), plate XXII (X), figure 19.

Type specimens. Lectotype: ZMB/Moll no. 109270a, from Station 100 (Francis Bay), here designated. Paralectotypes A-D ZMB/Moll no. 109270b-e.

Type locality. "Stationen 81 [Groβe Fischbucht], 95 [Cap Agulhas], 100 [Francis-Bucht], 101 [Algoa-Bucht]" (South Africa).

Original description. *Schalen von denselben Stationen 81, 95, 100 und 101 sind denen der vorigen Art [*Triphora capensis*] in Größe und Skulptur ähnlich, aber durch folgende Merkmale unterschieden: die Form ist etwas schlanker, die Anfangswindungen zeigen bereits deutliche Knoten und zwar in 2 Reihen, zwischen die sich alsdann eine dritte einschiebt, die 12½ Windungen der abgebildeten Schale sind nicht gewölbt, die letzte unten kantig und nur mit 3 Reifen unter der Kante besetzt, die Mündung ist niedriger, der Mundrand etwas flügelartig vorgezogen, oben zurücktretend, die untere Rinne etwas gebogen. Färbung braun. Auffällig ist allerdings die ganz gleiche Verbreitung, doch scheinen die angegeben Merkmale dagegen zu sprechen, daß beide Formen zu derselben Art gehören.*

Translation. Shells from stations 81, 95, 100 and 101 are similar to the ones of previous species [*Triphora capensis*] in size and sculpture, but distinguished by the following features: the shape is slightly slimmer, the protoconch whorls already show two rows of tubercles, between those the third row develops, the 12½ whorls of the shell are flat, the last whorl is angulated and bears three cords under the edge, the aperture is shorter, the peristome has a winged shape, with a developed posterior sinus, the siphonal canal bent slightly. The colour is brown. The overlap in distribution is remarkable, however the described characters show that both forms do not belong to the same species.

Diagnosis. Lectotype height 8.8 mm. Conical shell, with very flat sides. Teleoconch of nine whorls, which have three tubercled spiral cords: the second develops later and is fully visible on the third whorl. A fourth suprasutural smooth cord is also present. The base has two further smooth spiral cords. Peristome simple, without bifurcating cords. A deep posterior siphonal canal is present. Paucispiral large apex of three whorls; the transition to teleoconch is difficult to spot. The protoconch is ornamented by two strong tubercled spiral cords. Colour light brown, apex slightly darker.

Remarks. The specimen figured in Thiele's work lacks the lower part of the last whorl near the aperture, like the best syntype available, which is here designated as lectotype. Station 81 is probably located in Agulhas Bank and not in Angola as the geographic coordinates would suggest (Kilburn 1996) (see Materials and methods).

Triphora brevis Thiele, 1925

Figure 4

Triphora brevis Thiele, 1925: 129 (95), plate XXII (X), figure 20.

Type specimens. Holotype: ZMB/Moll no. 109271, fixed by monotypy.

Type locality. "Station 101 [Algoa-Bucht]" (South Africa).

Original description. *Eine kleine und anscheinend ausgewachsene Schale von Station 101 (Algoa-Bucht) scheint gleichfalls zu einer noch nicht bekannten Art zu gehören. Sie ist bräunlich, ziemlich kurz spindelförmig, oben kurz zugespitzt, von den 8 Windungen zeigt die erste einen Besatz mit herablaufenden, zweimal stark geknickten Fäden, die folgenden haben anfangs 2, dann 3 Reihen starker Knoten. Bei der letzten ist der Reifen an der unteren Kante noch deutlich knotig, darunter finden sich noch 2 glatte Reifen. Spindelfortsatz ziemlich kurz und breit, Mündung klein, Mundrand unten etwas vorgezogen. Höhe 3,3 mm, Durchmesser 1,25 mm.*

Translation. One small and seemingly adult shell from station 101 (Algoa Bay) seems also to belong to a not yet known species. It is brownish, quite small and fusiform, with an obtuse top; of the eight whorls, the first shows two strong undulated cords, while the following whorls have initially 2, then 3 cords with tubercles. The last whorl is still clearly tubercled, but two smooth cords are present below it. Siphonal canal quite short and large, aperture small; the aperture is slightly rounded. Height 3.3 mm, diameter 1.25 mm.

Diagnosis. Holotype height 3.4 mm. Conical shell, with deep sutures. Teleoconch of five whorls, which have three tubercled spiral cords: the second develops later and is fully visible at half shell height. A very fine suprasutural smooth cord is also present. The last whorl has a fourth weakly tubercled cord, and the base has a further smooth spiral cord. Peristome simple, without bifurcating cords. Paucispiral large apex of two whorls. The first whorl is smooth, while the second is slightly angulated and ornamented by flexuous axial ribs. Colour light brown, but the holotype is worn and the colour may be faded.

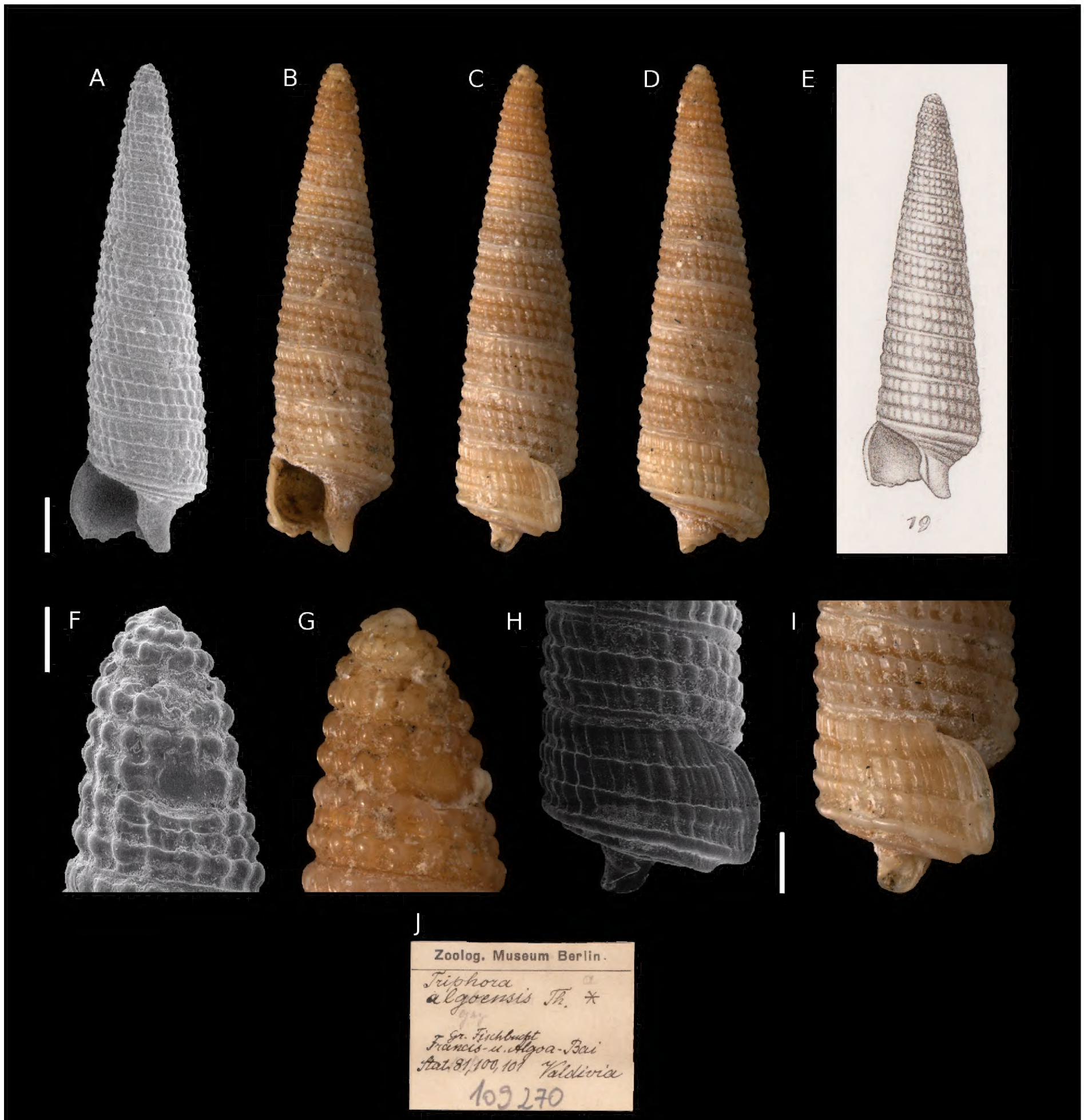

Figure 3. *Triphora algoensis* Thiele, 1925, Station 100 (Francis Bay). **A-D**, **F-I**. Lectotype, ZMB/Moll no. 109270a: front (**A-B**), side (**C**), back (**D**), protoconch (**F-G**), peristome (**H-I**). **E**. Original figure in Thiele 1925. **J**. Original label. Scale bar: **A-D**: 1 mm, **F-G**: 0.3 mm, **H-I**: 0.6 mm.

Triphora capensis Thiele, 1925

Figure 5

Triphora capensis Thiele, 1925: 128 (94), plate XXII (X), figures 18 and 18a.

Type specimens. Lectotype: ZMB/Moll no. 109269a, here designated from station 101 (Algoa Bay). Paralectotype A: ZMB/Moll no. 109269b; further 11 paralectotypes: ZMB/Moll no. 109269.

Type locality. "Stationen 81 (Große Fischbucht), 95 (Cap Agulhas), 100 (Francis-Bucht) und 101 (Algoa-Bucht)" (South Africa).

Original description. *Stationen 81 (Große Fischbucht), 95 (Cap Agulhas), 100 (Francis-Bucht) und 101 (Algoa-Bucht). Einige Schalen, z. T. unvollkommen erhalten, kann ich auf keine bekannte Art beziehen, sie gehören in die Gruppe der* T. perversa, *von der sie deutlich verschieden*

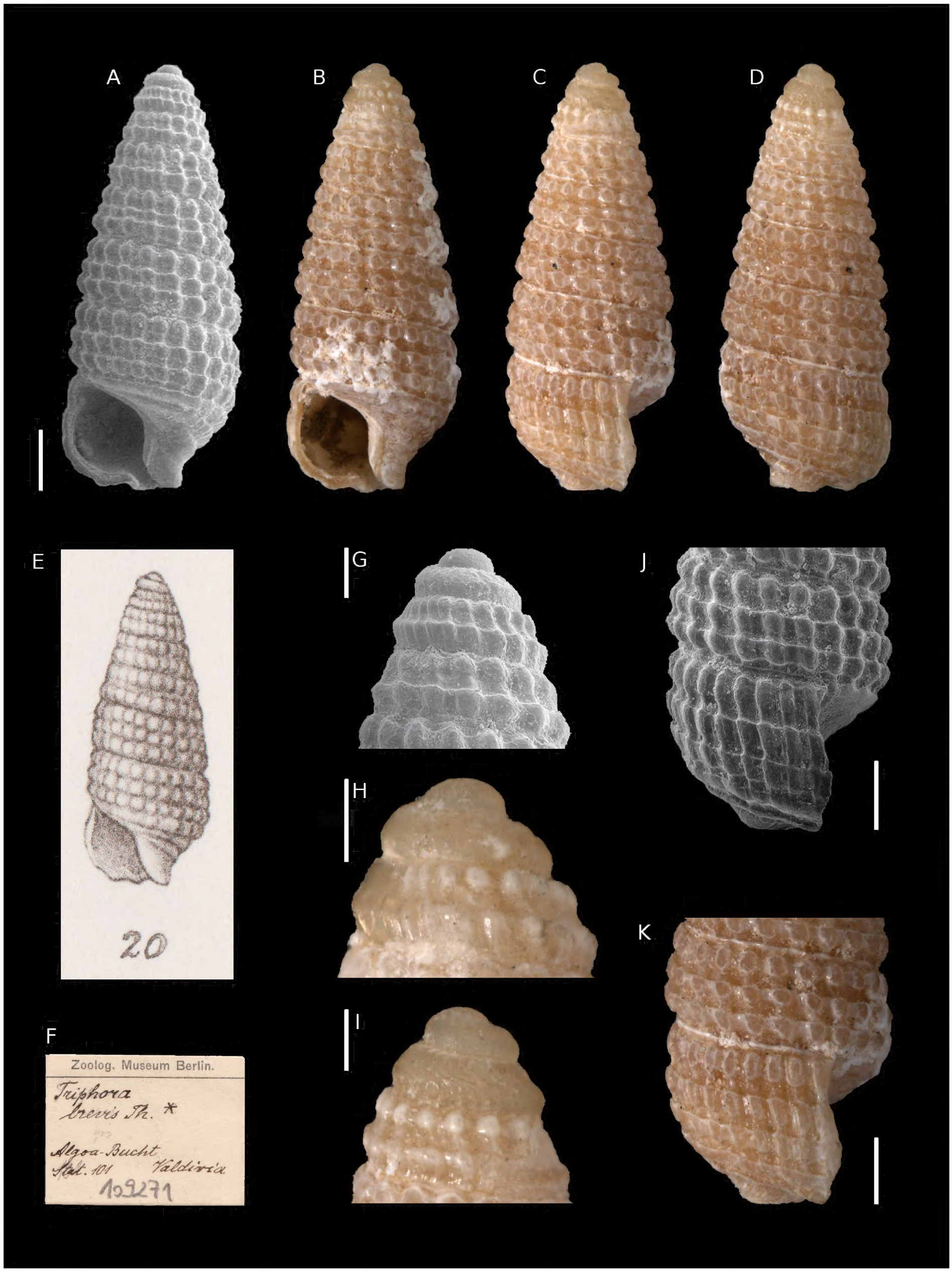

Figure 4. *Triphora brevis* Thiele, 1925, Station 101 (Algoa Bay). **A-D**, **G-K**. Holotype, ZMB/Moll no. 109271: front (**A-B**), side (**C**), back (**D**), protoconch (**G-H**), protoconch backside (**I**), peristome (**J-K**). **E**. Original figure in Thiele 1925. **F**. Original label. Scale bar: **A-D**: 0.5 mm, **G-I**: 0.2 mm, **J-K**: 0.4 mm.

sind. Die etwas bräunlichen Schalen sind hoch kegelförmig, aus 11 kaum gewölbten Windungen gebildet, deren erste abgerundet und mit 3 Reifen skulptiert einen etwas abgestumpften Apex bilden, während die übrigen außer den 3 Reifen noch herablaufende Falten zeigen, die an den Schnittpunkten deutliche Knoten bilden, an der Naht ist noch ein glatter Reifen sichtbar. Letzte Windung mit einem großen geraden Spindelfortsatz und mit 4 Reifen an der Unterseite, die in einem stumpfen Winkel zum oberen Teil steht; Mündung ziemlich groß, abgerundet rautenförmig. Höhe 8 mm, Durchmesser 2,25 mm.

Translation. Stations 81 ("Große Fischbucht"), 95 (Cape Agulhas), 100 (Francis Bay) and 101 (Algoa Bay). I obtained some imperfect shells, which I cannot relate with any known species; they belong to the group of *T. perversa,* but they are clearly different. The slightly brownish shells are high and conical, and have 11 slightly inflated whorls, the first whorl is rounded and sculptured by 3 cords, forming an obtuse apex, while the following whorls have axial ribs which bear tubercles at the intersection with the spiral cords; at the suture a further smooth thread is visible. The last whorl has a big straight siphonal canal and with 4 cords on the base, the last whorl has a blunt angle between the lower and upper part; aperture rather large, diamond-shaped. Height 8 mm, diameter 2.25 mm.

Diagnosis. Lectotype height 8 mm. Shell conical, with rather flat whorls. Teleoconch of nine whorls, which have three tubercled spiral cords, present since the first teleoconch whorl. A fourth suprasutural smooth cord is also present. The base has five smooth spiral cords. The peristome is not complete in the type material, but it does not seem to bear bifurcated spiral cords. Paucispiral large apex of two whorls with three large spiral cords which are initially smooth and then become tubercled. Colour brownish, with the first spiral cord on whorls paler (colour pattern clearly visible in paralectotype A, Fig. 5 I-K).

Remarks. The sample from station 81 contains specimens which are broken or juvenile and difficult to assign to any species. At least one specimen is certainly not *T. capensis*, because it bears a planktotrophic apex. Station 81 is probably located in Agulhas Bank and not in Angola as the geographic coordinates would suggest (Kilburn 1996) (see Materials and methods).

Triphora dilecta Thiele, 1925

Figure 6

Triphora dilecta Thiele, 1925: 126 (92), plate XXII (X), figure 12.

Type specimens. Lectotype: ZMB/Moll no. 109263a, here designated. Paralectotypes A-C: ZMB/Moll no. 109263b-d.

Type locality. "Station 95 (34°51'Südl. Br., 19°37,8' östl. L., 80 m Tiefe, bei Cap Agulhas)" (South Africa).

Original description. *Von Station 95 (34°51' südl. Br., 19°37,8' östl. L., 80 m Tiefe, bei Cap Agulhas) liegen 4 meistens schlecht erhaltene Schalen vor, deren beste ich abbilde. Die Art, der ich den obigen Namen gebe, ist durch ihre schlanke, gerade Form und ihre geringe Skulptur sehr ausgezeichnet. Die Schal ist weiß, glatt und glänzend, hoch getürmt und schmal; die gezeichnete Schale zeigt 12 Windungen, von denen die erste ziemlich groß, glatt und rundlich ist, während die folgenden nur 2 Spiralfurchen aufweisen, deren eine feinere dicht über der Naht verläuft, während die andere etwas darüber gelegen und merklich breiter ist, die obere Hälfte zeigt nur eine leichte Einschnürung infolge des etwas wulstigen oberen Randes. Auch die letzte Windung hat weiter keine Skulptur, die Spindel ist gerade und ziemlich lang, die vielleicht noch unfertige Mündung einfach rautenförmig mit kurzer Rinne. Höhe 6 mm, Durchmesser 1,4 mm.*

Translation. From station 95 (34°51'S, 19°37.8'E, 80 m depth, near Cape Agulhas) there are four poorly preserved shells, of which I figure the best. The species, to which I give a name here, is very slender, the very straight shape and the fine sculpture are very typical. The shell is white, smooth and shiny, high and slender; the figured shell has 12 whorls, of which the first is quite large, smooth and rounded, while the following whorls have two spiral grooves, a finer groove is visible just above the suture, while the other is located higher on the whorl and much wider, the upper part of the shell shows a slight constriction [because the protoconch whorls are larger than the first teleoconch whorl]. Also the last whorl has not any other sculpture, the siphonal canal is straight and quite long, and the probably undeveloped aperture is diamond-shaped with a short canal. Height 6 mm, diameter 1.4 mm.

Diagnosis. Lectotype height 6.3 mm. Shell very slender, conical, with flat whorls. Teleoconch of nine whorls, which have three flat broad spiral cords; the first two become a single broader one towards the last whorl. A fine suprasutural smooth cord is also present. The base is smooth. The peristome without any specific ornamentation, lip very thin (it may not be fully developed in the lectotype, although the base is fully developed, thus the specimen is adult). Paucispiral large apex of three whorls; the first whorl is smooth, while the other two bear a strong keel. Colour white.

Remarks. This species is remarkable because of the lack of tubercles, which are present in most triphorids.

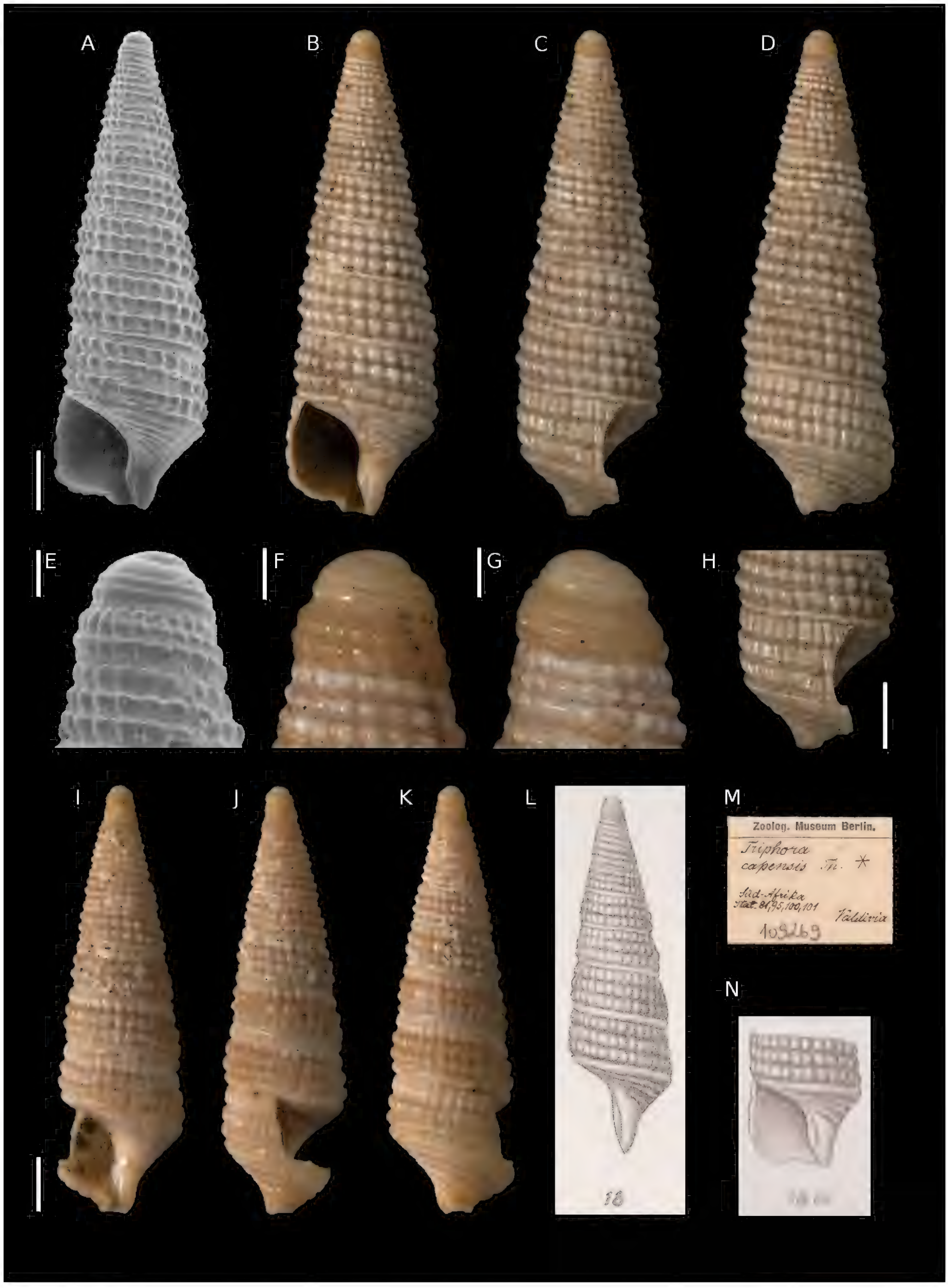

Figure 5. *Triphora capensis* Thiele, 1925, Station 101 (Algoa Bay). **A-H**. Lectotype, ZMB/Moll no. 109269a: front (**A-B**), side (**C**), back (**D**), protoconch (**E-F**), protoconch side (**G**) and peristome (**H**). **I-K**. Paralectotype A, same stations as lectotype, ZMB/Moll no. 109269b: front (**I**), side (**J**), back (K). **L**, **N**. Original figure in Thiele 1925. **M**. Original label. Scale bar: **A-D**: 1 mm, **E-F**: 0.2 mm, **G-H**: 1 mm, **I-K**: 1 mm.

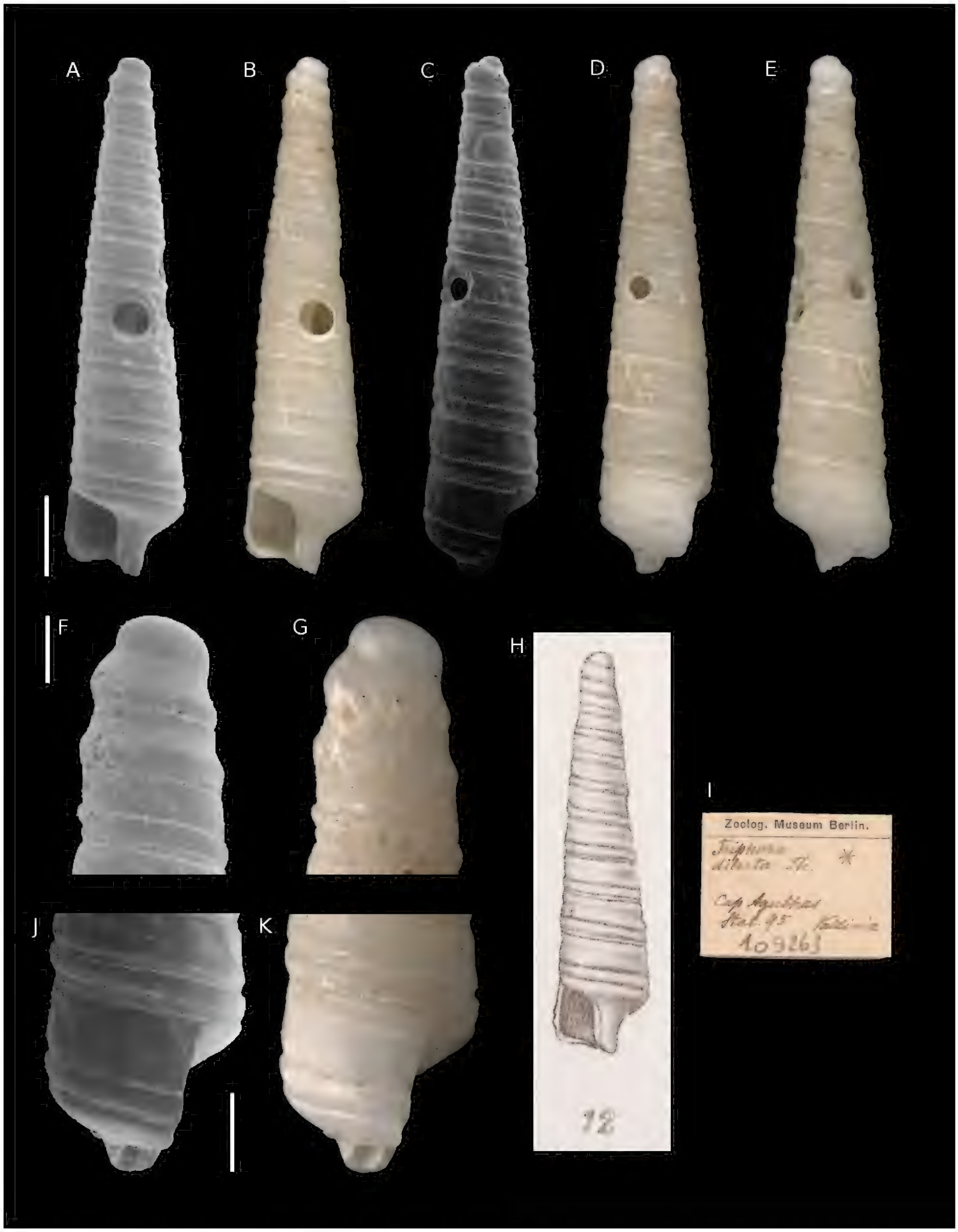

Figure 6. *Triphora dilecta* Thiele, 1925, Station 95 (34°51'S, 19°37.8'E, 80 m depth, near Cape Agulhas). **A-G**, **J-K**. Lectotype, ZMB/Moll no. 109263a: front (**A-B**), side (**C-D**), back (**E**), protoconch (**F-G**), peristome (**J-K**). **H**. Original figure in Thiele 1925. **I**. Original label. Scale bar: **A-E**: 1.0 mm, **F-G**: 0.3 mm, **J-K**: 0.4 mm.

Triphora erecta Thiele, 1925

Figure 7
Triphora erecta Thiele, 1925: 127 (93), plate XXII (X), figure 14.

Type specimens. Holotype: ZMB/Moll no. 109265, fixed by monotypy.

Type locality. "Station 104 (35°16' südl. Br., 22°26,7' östl. L., 155 m Tiefe, bei der Agulhasbank)" (South Africa).

Original description. *Eine mangelhaft erhaltene Schale von Station 104 (35°16' südl. Br., 22°26.7' östl. L., 155 m Tiefe, bei der Agulhasbank) erinnert in der Skulptur und Mündungsform an* Laecochlis granosa *(S. Wood), es muß dahingestellt bleiben, ob sie zu dieser Gruppe gehört. Der Schale fehlt das obere Ende, es sind nur 8-9 Windungen vorhanden, auch der Mündungsrand ist beschädigt. Die Windungen nehmen sehr langsam zu, daher ist die Schale sehr hoch und schlank, die Windungen sind deutlich gewölbt, die Naht eingedrückt. Die Oberfläche ist mit 5 glatten Reifen besetzt, die etwa so breit sind wie ihre Zwischenräume. Unterseite der letzten Windung glatt, Spindel ziemlich lang, etwas gedreht, unterer Kanal ziemlich lang, schräg abwärts gerichtet. Durchmesser fast 3 mm.*

Translation. A poorly preserved shell from station 104 (35°16'S, 22°26.7'E, 155 m depth, near Agulhas Bank), which reminds the sculpture and aperture of *Laecochlis granosa* (S. Wood); it is unclear if the species belongs to this group [Triphoridae]. The shell misses the apical part, there are 8-9 whorls visible, and also the aperture is damaged. The whorls slowly increase in size, this makes the shell very long and slender, the whorls are clearly convex, and the suture is deep. The surface of the whorls has five smooth spiral cords, which are about as wide as their interspaces. The lower part of the last whorl is smooth, the columella is fairly long, a little bit twisted, the siphonal canal fairly long, with its end bent. Diameter almost 3 mm.

Diagnosis. Teleoconch of the holotype of seven whorls and 11.8 mm high, but the species is certainly much longer, because the holotype is just a fragment. Very slender shell, with poorly inflated whorls. Teleoconch whorls have four flat broad spiral cords and a suprasutural smooth cord. The holotype is probably a subadult, hence little can be said on the peristome and the base. Also the apex is missing. Colour greyish, but the specimen is definitely poorly preserved.

Remarks. Also this species bears a striking ornamentation of smooth spiral cords like *T. dilecta*, but can be easily distinguished for its size, shape, and arrangement of cords.

Triphora innocens Thiele, 1925

Figure 8
Triphora innocens Thiele, 1925: 127 (93), plate XXII (X), figures 13 and 13a.

Type specimens. Lectotype ZMB/Moll no. 109264a (from Station 95), here designated. Further two badly preserved specimens in lot from station 95, two specimens from station 105 and 3 specimens from station 106 whose conspecificity is questionable (see Remarks).

Type locality. "Station 95 [34°51' südl. Br., 19°37,8' östl. L., 80 m Tiefe, bei Cap Agulhas] und von Station 106 (35°26,8' südl. Br., 20°56,2' östl. L., Agulhas-Bank)" (South Africa).

Original description. *Einige mangelhaft erhaltene Schalen von derselben Station 95 und von Station 106 (35°26,8' südl. Br., 20°56,2' östl. L., Agulhas-Bank) gehören zu derselben Gruppe, wie die vorige Art [*Triphora dilecta*], sind aber durch 3 gleichstarke Reifen ausgezeichnet in Verbindung mit ihrer weißen Färbung; die vorher genannte* T. cingulata *A. Ad. ist grau, ihr Mittelreifen schwächer als die beiden anderen und die Zwischenräume sind stark längsgestreift, danach kann sie nicht unsere Art sein. Nach dem vorliegenden Material kann ich die Zahl der Windungen nicht sicher angeben, bei dem in Figur 13 dargestellten Endstück dürfte sie 12-13 betragen. Die mehr oder weniger aufgetriebene Anfangswindung zeigt schon die Reifen, die bis zum Ende verlaufen, die unteren Windungen lassen noch einen Teil eines vierten Reifens erkennen, dem sich die folgende anheftet, und bei der letzten sind an der Unterseite noch 2 Reifchen sichtbar, so daß diese im ganzen 6 Reifen trägt. Spindel kurz, Mündung einfach mit kurzem schrägem Kanal. Der Durchmesser des abgebildeten Stücks beträgt 1,6 mm, seine Höhe dürfte 8-9 mm betragen.*

Translation. Some poorly preserved shells from the station 95 and 106 (35°26.8'S, 20°56.2'E, Agulhas Bank) belong to the same group as the previous species [*Triphora dilecta*], they are very distinguishable because of the three spiral threads of equal strength and their white colour; the previously referred species *T. cingulata* A. Adams [Thiele referred to *T. cingulata* in the introduction to Triphoridae] is grey, its middle thread is weaker than the other two and between the threads there are vertical stripes visible, it cannot be our species. With the available material it is not possible to count the exact number of whorls, in figure 13 I have drawn a shell with 12-13 whorls. The few embryonal whorls show already the three spiral threads that run along the whorls until the lip, the teleoconch whorls show in the lower whorls even a fourth soprasutural spiral cord, on the base there are two other spiral cords visible, this brings the total

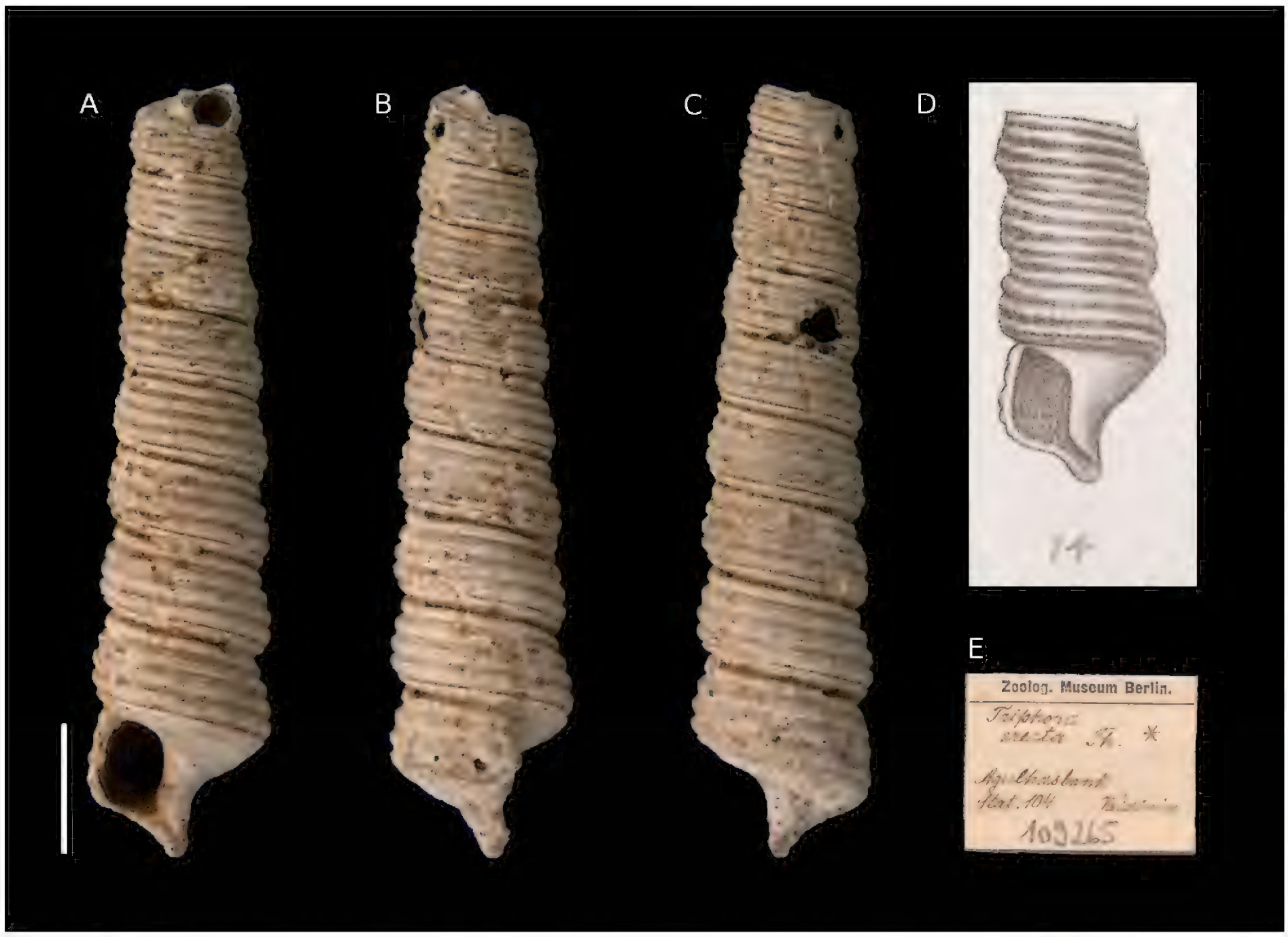

Figure 7. *Triphora erecta* Thiele, 1925, Station 104 (35°16'S, 22°26.7'E, 155 m depth, near Agulhas Bank). **A-C**. Holotype. ZMB/Moll no. 109265: front (A), side (B), back (C). **D**. Original figure in Thiele 1925. **E**. Original label. Scale bar: **A-C**: 2 mm.

number of spiral cords to six. The columella is short, the aperture is simple with a slightly twisted siphonal canal. The diameter of the figured specimens is 1.6 mm, the height might be 8-9 mm.

Diagnosis. Lectotype height 5.9 mm. Shell conical, with flat whorls. Teleoconch of nine whorls, which have three smooth spiral cords; a fine fourth suprasutural smooth cord is also present. Paucispiral large apex of three whorls, with two spiral keels and one subsutural one. Colour white. Base and peristome cannot be properly described on the basis of the type material.

Remarks. The material labelled as *Triphora innocens* contains three vials, collected at three different stations: 95, 105 and 106. Station 105 is not cited in the original description. The specimens under this name bear different apex morphologies. Specimens from station 95 have a protoconch with a first whorl wider than the second, and ornamented by two strong keels (Fig. 8 F-G), while the specimens in lots 105 and 106 have the first protoconch whorl much smaller than the others and have two strong spiral keels and one subsutural keel (Fig. 8 H-I). Also teleoconch profiles are different, to the extent that can be judged by subadult specimens. Specimens from station 95 have a more slender teleoconch (Fig. 8 A-D), while specimens from stations 105 and 106 are more conical, and probably larger at adult size (Fig. 8 J-K).

It is unclear if this can be regarded as infraspecific variability or suggests that multiple species were mixed up in the lot. The lack of fully adult specimens, although figure 13 apparently shows a fully grown shell, is a further impediment to a thorough understanding of the species variability. Nonetheless, the original figure 13 represents the apical part similar to the largest specimen of station 95; it is indeed the specimen in best condition, although not fully adult, and is here designated as lectotype. The sample from station 95 also contained fragments of adult specimens, but without apex. Due to the importance of apex morphology for species identification in Triphoridae, we did not select as lectotype any of such specimens.

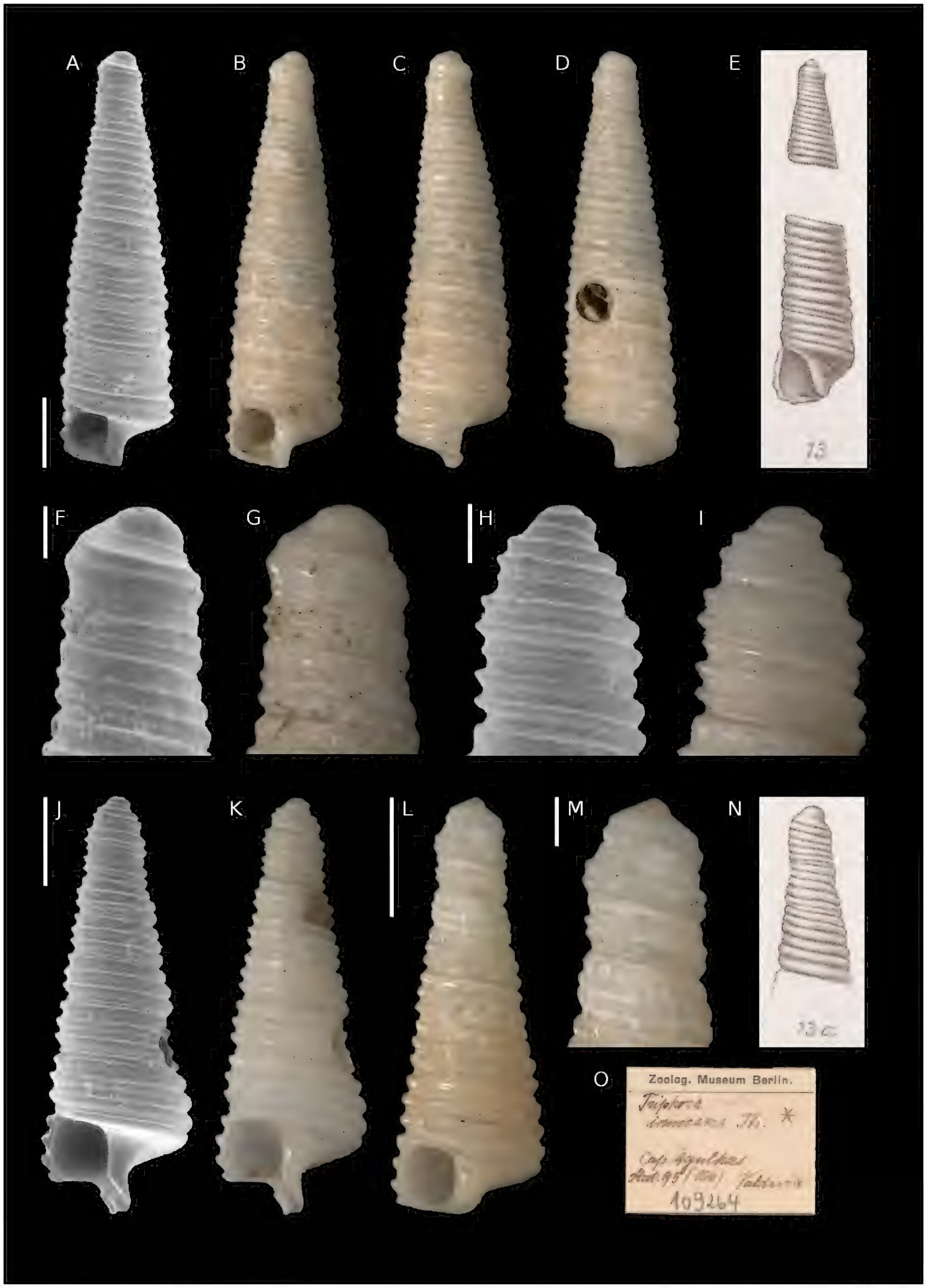

Figure 8. *Triphora innocens* Thiele, 1925. **A-D**, **F-G**. Lectotype, Station 95 (Agulhas Bank), ZMB/Moll no. 109264a: front (**A-B**), side (**C**), back (**D**), protoconch (**F-G**). **E, N**. Original figure in Thiele 1925. **H-K**. Station 106 (Agulhas Bank), ZMB/Moll no. 1090264a: protoconch (**H-I**), front (**J-K**). **L-M**. Station 95 (Agulhas Bank), ZMB/Moll no. 1090264: front (**L**), protoconch (**M**). **O**. Original label. Scale bar: **A-D**, **J-L**: 1 mm. **F-I**, **M**: 0.25 mm.

Triphora patricia Thiele, 1925

Figure 9
Triphora patricia Thiele, 1925: 128 (94), plate XXII (X), figure 16.

Type specimens. Lectotype: ZMB/Moll no. 109267a (Station 95), here designated. Paralectotype A: ZMB/Moll no. 109267b (Station 105); paralectotypes B-D: ZMB/Moll no. 109267c-e (Station 106).

Type locality. "Station 95 (Cap Agulhas), Station 105 (35°29' südl. Br., 21°2,5' östl. L., 102 m Tiefe) und Station 106 (35°26,8' südl. Br., 20°56,2' östl. L., Agulhasbank)" (South Africa).

Original description. *Station 95 (Cap Agulhas), Station 105 (35°29' südl. Br., 21°2,5' östl. L., 102 m Tiefe) und Station 106 (35°26,8' südl. Br., 20°56,2' östl. L., Agulhasbank), einige, meist junge Schalen haben einige Aehnlichkeit mit der westindischen* T. triserialis *Dall, die aber oben mehr zugespitzt ist. Die weißen Schalen sind sehr schlank mit kaum gewölbten, wenig zunehmenden Windungen, deren erste und zweite kurz abgerundet und mit 2 Reifen besetzt sind, während alle folgenden 3 Spiralreihen von rundlichen Körnchen tragen, an der Naht ist noch ein schmaler glatter Reifen sichtbar. Dieser bildet bei der letzten Windung eine starke Kante und unter ihm ist noch ein Reifen vorhanden. Spindelfortsatz gerade, mäßig lang, Mündung viereckig (bei der abgebildeten Schale beschädigt). Höhe 7 mm, Durchmesser 1,6 mm.*

Translation. Station 95 (Cape Agulhas), station 105 (35°29'S, 21°2.5'E, 102 m depth) and station 106 (35°26.8'S, 20°56.2'E, Agulhas Bank), some of the mostly juvenile shells have some resemblance with the West Indian species *T. triserialis* Dall, which has a more pointed top. The white shells are very slender with slightly rounded whorls which increase little in size; the first and second embryonal whorls are slightly rounded and sculptured with two spiral keels, while all the following whorls show three spiral cords with tubercles; on the suture, another finer smooth cord is visible. The sutural cord forms on the last whorl a strong edge and underneath this edge another spiral cord is visible. The siphonal canal is straight, moderately long and the aperture is sub-quadrangular (the aperture is damaged on the figured shell). Height 7 mm, diameter 1.6 mm.

Diagnosis. Lectotype height 7.0 mm. Shell very slender, conical, with almost flat whorls. Teleoconch of nine whorls, which have three tubercled spiral cords, well developed since the first teleoconch whorl. A very fine suprasutural smooth cord is also present, but barely visible in most apical whorls. Paucispiral large apex of four whorls; the first whorl bears two strong smooth spiral cords, while the others bear three tubercled cords. Colour white. Base and peristome cannot be properly described on the basis of the studied type material.

Triphora plebeja Thiele, 1925

Figure 10
Triphora plebeja Thiele, 1925: 129 (95), plate XXII (X), figure 21.

Type specimens. Lectotype: ZMB/Moll no. 109272a from Station 100, here designated. Paralectotype A: ZMB/Moll no. 109272b from Station 100; Paralectotype B: ZMB/Moll no. 109272c from Station 101; Paralectotype C: ZMB/Moll no. 109272d from Station 106.

Type locality. "Stationen 100 (Francis-Bucht), 101 (Algoa-Bucht) und 106 (Agulhasbank)" (South Africa).

Original description. *Schalen von den Stationen 100 (Francis-Bucht), 101 (Algoa-Bucht) und 106 (Agulhasbank) unterscheiden sich von den bisher genannten Arten durch ihre spitze, aus 5 Windungen bestehende Embryonalschale mit einer aus herablaufenden Fäden und 2 Spiralreifen bestehenden Skulptur, sie sind braun, lang kegelförmig, im ganzen mit 11 Windungen, von denen die auf die Embryonalschale folgenden 2, die übrigen 3 Reihen von Knoten aufweisen; die letzten werden kaum breiter, bei ihnen ist ein schmaler Reifen über der Naht sichtbar. Außer diesem, der die untere Kante bildet, hat die letzte Windung noch 3 glatte Reifen an der Unterseite. Spindelfortsatz und Mundrand sind beschädigt. Höhe 4,5 mm, Durchmesser 1,25 mm.*

Translation. Shells from station 100 (Francis Bay), 101 (Algoa Bay) and 106 (Agulhas Bank) are distinguishable from all the previous species by their pointy protoconch, composed of 5 embryonal whorls with two spiral keels and axial riblets; the shells are brown, long and conical, in total 11 whorls, of which the first whorls after the embryonal whorls have two rows of tubercles and the lower whorls 3 rows, the last one is barely wider, above the suture a smaller cord is visible. The base has further three smooth cords visible. Siphonal canal and aperture are damaged. Height 4.5 mm, diameter 1.25 mm.

Diagnosis. Lectotype height 4.5 mm. Shell conical, with flat whorls. Teleoconch of nine whorls, which have three tubercled broad spiral cords; the second one appears lately, on the fifth whorl. A fine suprasutural smooth cord is also present. The last whorl has a fourth smooth spiral cord, and the base has further three smooth spiral cords. The peristome of the lectotype has been rebuilt after breaking (there is a scar, likely due to a predatory attempt), hence it is not fully reliable. Nonetheless, the sculpture of the peristome seems not to bear bifurcating ribs. Multispiral apex of five whorls; a bit worn in the lectotype; nonetheless, it clearly bears two keels and fine axial riblets on the lower three whorls. Colour light brown, the first tubercled cord looks lighter, but colours may be faded, because the specimens were dead collected.

Remarks. This is the only species with planktotrophic apex described by Thiele from South Africa.

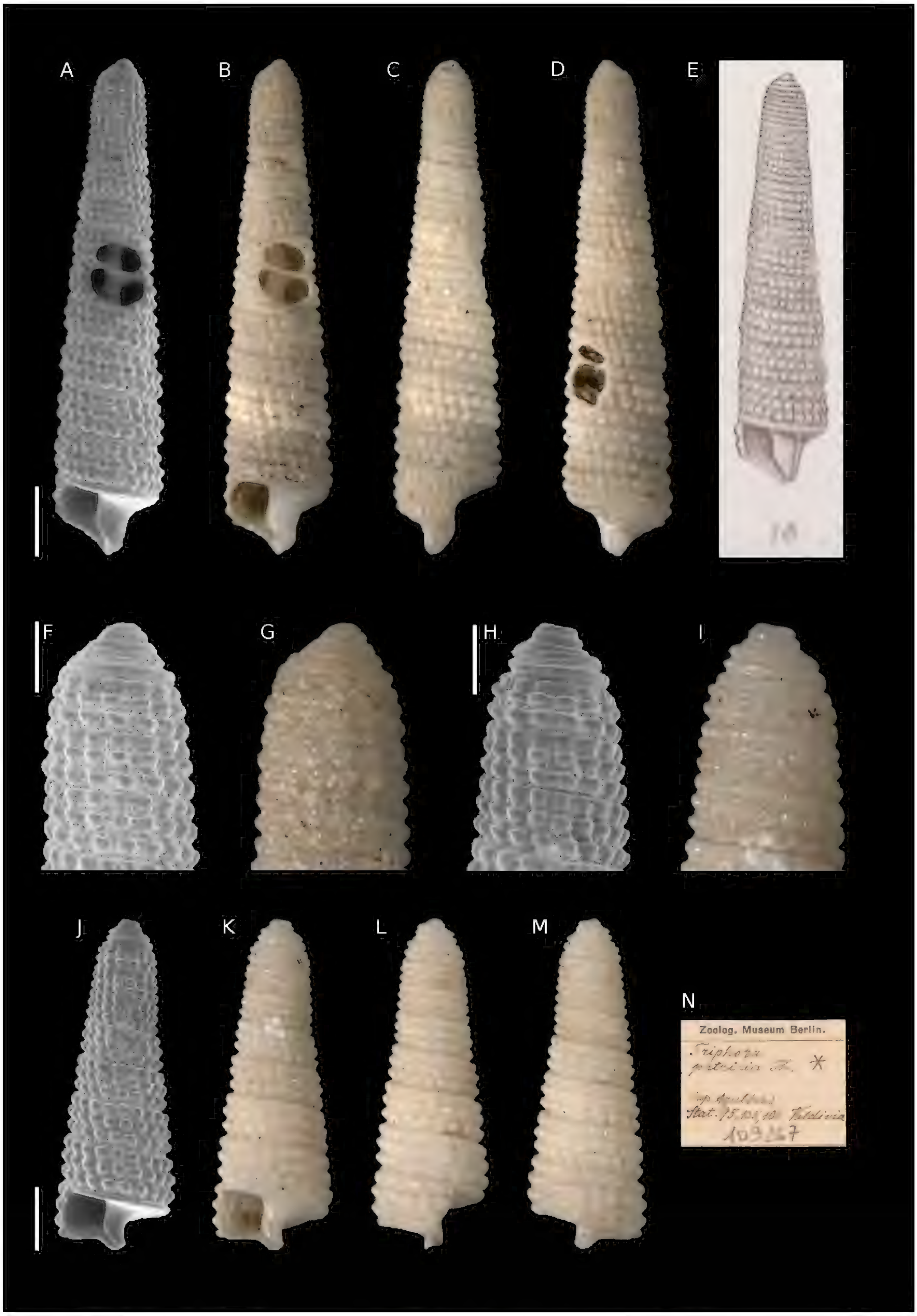

Figure 9. *Triphora patricia* Thiele, 1925. **A-D**, **F-G.** Lectotype, Station 95 (Cape Agulhas), ZMB/Moll no. 109267a: front (**A-B**), side (**C**), back (**D**), protoconch (**F-G**). **H-M**. Paralectotype A, Station 105 (35°29'S, 21°2.5'E) ZMB/Moll no. 109267b : protoconch (**H-I**), front (**J-K**), side (**L**), back (**M**). **E**. Original figure in Thiele 1925. **N**. Original label. Scale bar: **A-D**: 1 mm, **F-I**: 0.4 mm, **J-M**: 0.8 mm.

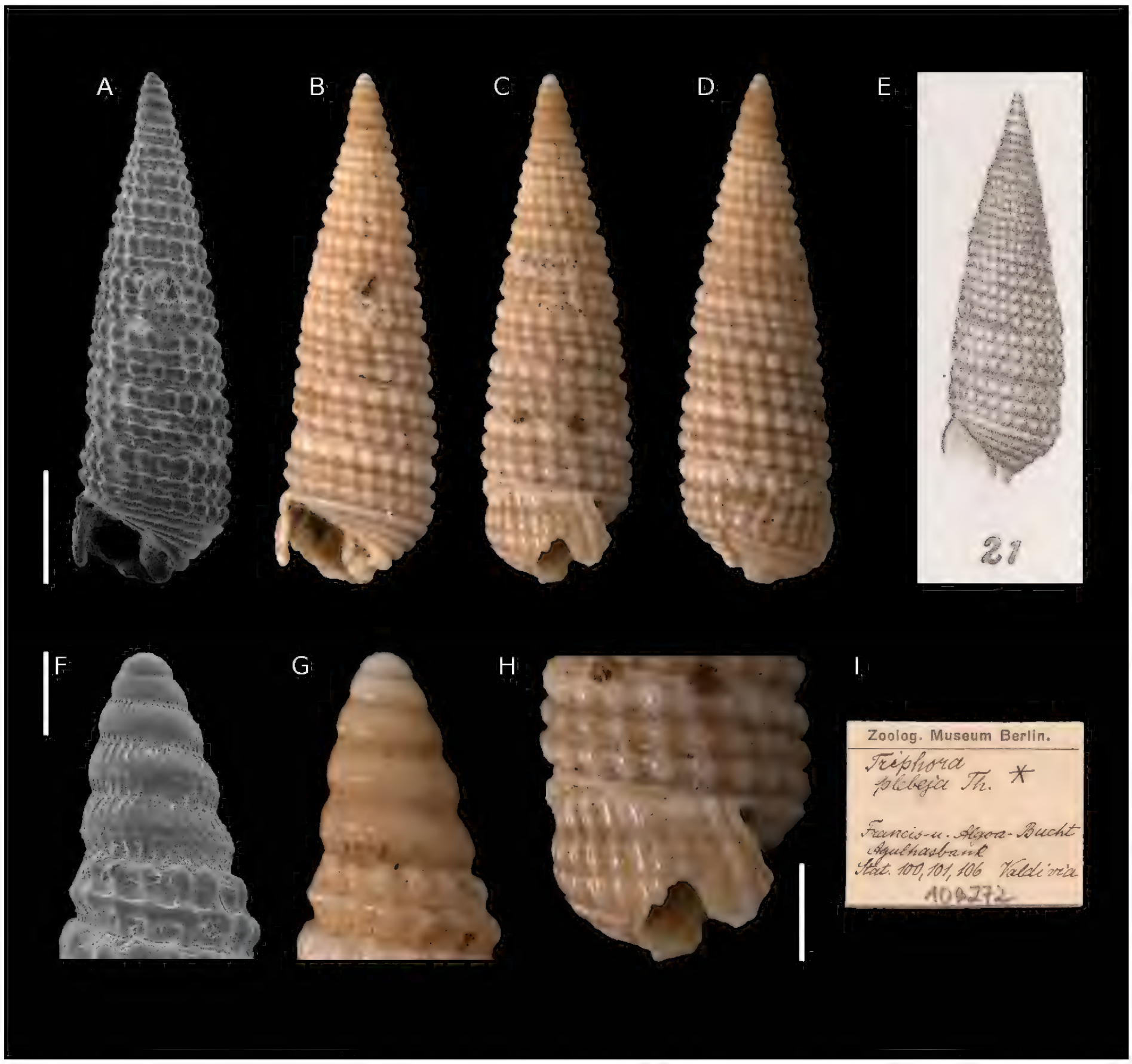

Figure 10. *Triphora plebeja* Thiele, 1925, Station 100 (Francis Bay). **A-D**, **F-H**. Lectotype. ZMB/Moll no. 109272a: front (**A-B**), side (**C**), back (**D**), protoconch (**F-G**), peristome (**H**). **E**. Original figure in Thiele 1925. **I**. Original label. Scale bar: **A-D**: 1 mm, **F-G**: 0.2 mm, **H**: 0.5 mm.

Triphora superba Thiele, 1925

Figure 11
Triphora superba Thiele, 1925: 127 (93), plate XXII (X), figure 15.

Type specimens. Holotype: ZMB/Moll no. 109266, fixed by monotypy.

Type locality. "Station 104 [35°16' südl. Br., 22°267' östl. L., 155 m Tiefe, bei der Agulhasbank]" (South Africa).

Original description. *Eine jedenfalls noch nicht ausgewachsene Schale von derselben Station 104 erinnert durch ihre schlanke Form und die 2 Warzenreihen an die westindische* T. colon *Dall, von der die Anfangswindungen unbekannt sind. Die weiße Schale besteht aus 10 langsam zunehmenden, nicht gewölbten Windungen, deren erste groß und anfangs glatt, dann mit 2 Reifen besetzt ist, die sich auf die beiden nächsten Windungen fortsetzen, um weiterhin in 2 Körnerreihen überzugehen, über der Naht ist der glatte Reifen sichtbar, dem sich die folgende Windung ansetzt. Die letzte Windung ist unten flach und glatt, der Spindelfortsatz kurz, die Mündung klein und viereckig. Höhe 3,3 mm, Durchmesser 0,8 mm.*

Translation. A shell that is definitely not yet adult from the same station 104 [Agulhas Bank] resembles the West-Indian species *T. colon* Dall, because of the slim shape and the two rows of tubercles; the apex of *T. colon*

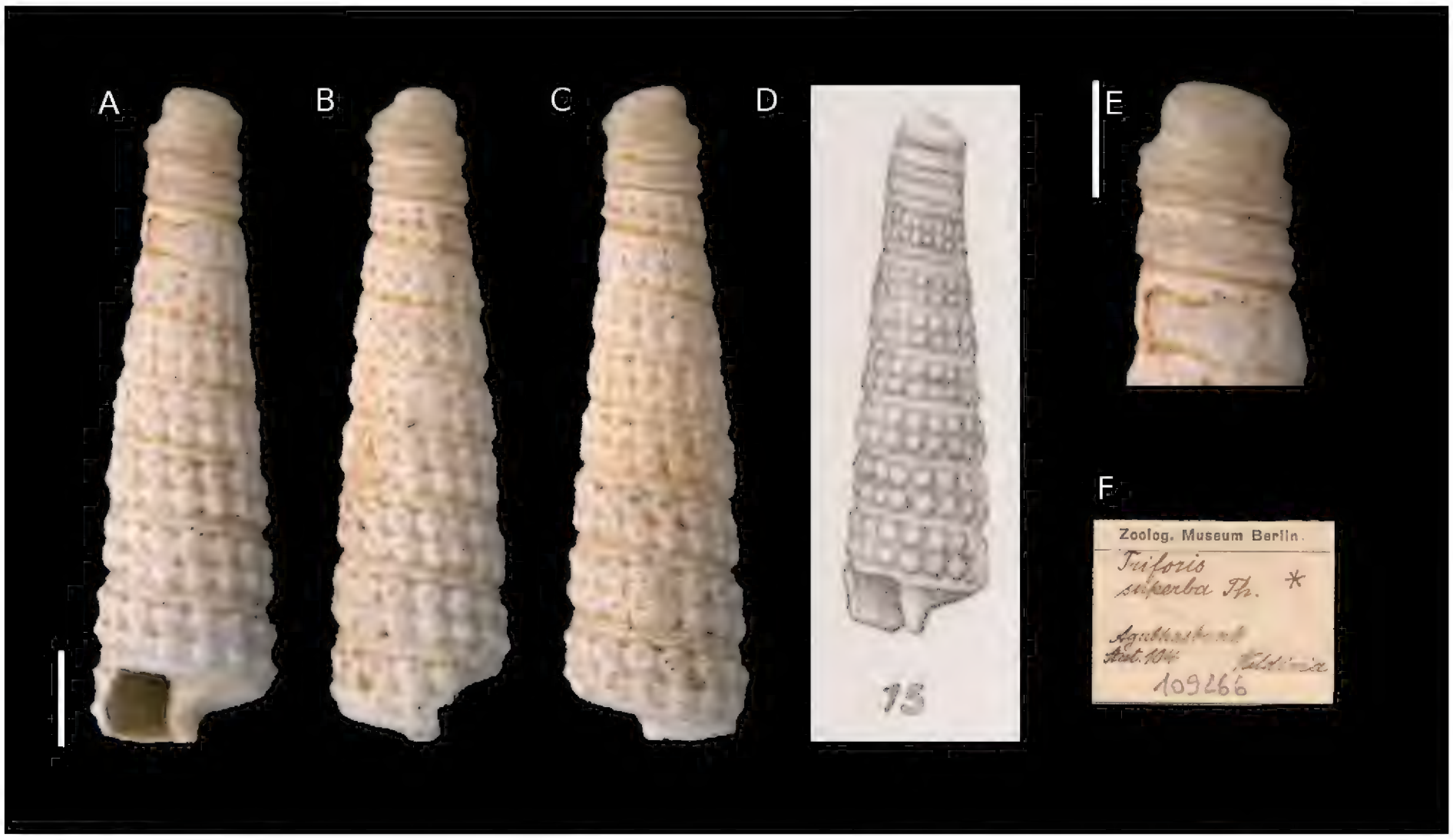

Figure 11. *Triphora superba* Thiele, 1925, Station 104 (Agulhas Bank). **A-C**, **E**. Holotype, ZMB/Moll no. 109266: front (**A**), side (**B**), back (**C**), protoconch (**E**). **D**. Original figure in Thiele 1925. **F**. Original label. Scale bar: **A-C**: 0.5 mm, **E**: 0.2 mm.

is not known. The white shell has 10 flat whorls which slowly increase in size; the first [protoconch] whorl is big and initially smooth, then sculptured with two keels, which continue on the next two whorls to become two cords with tubercles; above the suture a further smooth cord is visible. The last whorl is on the underside flat and smooth, the siphonal canal is short, the aperture is small and quadrangular. Height 3.3 mm, diameter 0.8 mm.

Diagnosis. Holotype height 3.4 mm and teleoconch of seven whorls, but the holotype is clearly a subadult specimen. Shell slender, with flat whorls. Teleoconch whorls have two tubercled spiral cords; a fine suprasutural smooth cord is also present. Paucispiral large apex of three whorls: the first whorl is smooth, while the other two bear two strong spiral cords. Colour white, but the specimen is worn, therefore the colour cannot be reliably described. Base and peristome cannot be properly described on the basis of the type material.

Indo-Pacific species

***Triphora adela* Thiele, 1930**

Figure 12

Triphora adela Thiele, 1930: 577, plate IV, figure 38.

Type specimens. Holotype: ZMB/Moll no. 67493, fixed by monotypy.

Type locality. "Station 25 (Sharks Bay)" (Western Australia).

Original description. *Eine Schale von Station 25 (Sharks Bay) hat etwa 11 mäßig schnell zunehmende Windungen, sie ist daher ziemlich breit, im ganzen hell bräunlich, auf der Endwindung sind die Zwischenräume zwischen den Knoten und hauptsächlich die Unterseite dunkelbraun. Die Embryonalwindungen sind mit einer Mittelkante und herablaufenden Fäden skulptiert, die folgenden Windungen mit 2 Knotenreihen zwischen denen ein allmählich stärker und knotig werdender Reifen gelegen ist, die Unterseite der Endwindung hat 3 glatte Reifen, die Mündung ist oben spitzwinklig. Höhe 3 mm, Durchmesser 0,9 mm.*

Translation. A single shell from Station 25 (Shark Bay), which has about 11 whorls which increase moderately fast in size, it is therefore fairly broad; the shell is light brownish, but dark brown between the tubercles on the last whorl and on the base. The embryonal whorls have a spiral keel in the middle and axial riblets, the following whorls have two rows of tubercles and between them a tubercled row develops and gradually becomes stronger; the base has three smooth cords, the aperture has an acute angle on the upper part. Height 3 mm, diameter 0.9 mm.

Diagnosis. Lectotype height is 3.0 mm. Shell conical, with flat whorls. The teleoconch has six whorls with three tubercled spiral cords; the second is present since the first teleoconch whorl, but it gains its full size only on the last whorl. Suture deep, a very fine suprasutural smooth cord is visible. The last whorl has

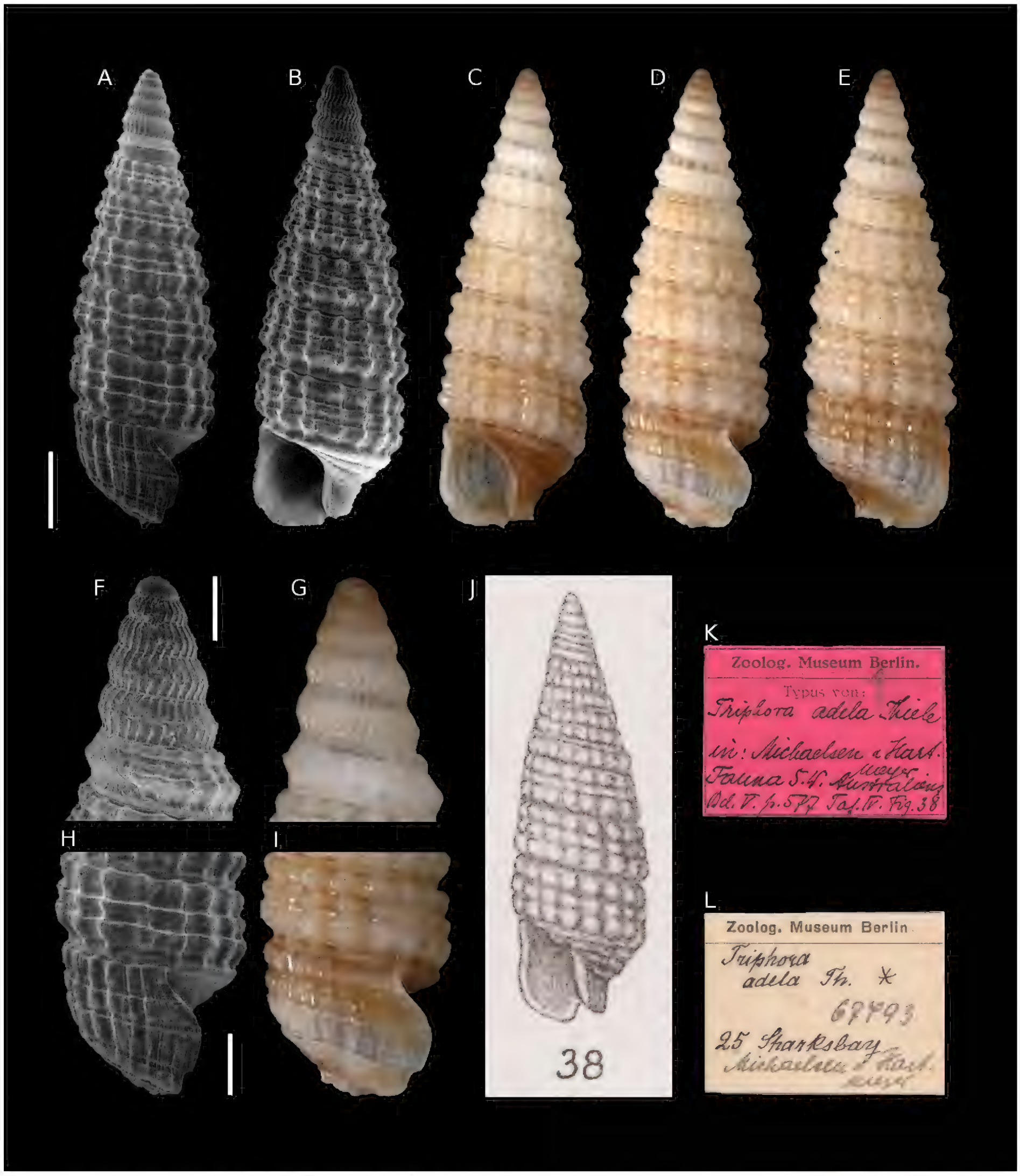

Figure 12. *Triphora adela* Thiele, 1930, Station 25 (Shark Bay). **A-I**. Holotype, ZMB/Moll no. 67493: left side (**A, D**), front (**B-C**), back (**E**), protoconch (**F-G**), peristome (**H-I**). **J**. Original figure in Thiele 1930. **K-L**. Original labels. Scale bar: **A-E**: 0.5 mm, **F-G**: 0.2 mm, **H-I**: 0.3 mm.

a fourth almost smooth spiral cord, and the base has two further smooth cords. A posterior sinus is well visible on the peristome. Multispiral apex of five whorls; the first whorl is smooth, while the others bear axial riblets and a strong keel. Protoconch whorls brownish at the beginning, then white like the first teleoconch whorls. The rest of the teleoconch is light brownish with white tubercles. The last whorl has the two first cords on brown background, the third is white, and the base deep brown.

Triphora aequatorialis Thiele, 1925

Figure 13
Triphora aequatorialis Thiele, 1925: 131-132 (97-98), plate XXII (X), figure 27.

Type specimens. Holotype: ZMB/Moll no. 109278, fixed by monotypy.

Type locality. "Station 244 [5°55.8' südl. Br., 39°1.2' östl. L., 50 m Tiefe, bei Ost-afrika]" (off Zanzibar, East Africa).

Original description. *Eine schale von derselben Station 244, die wohl verblaßt ist, zeigt noch am oberen Teil der Windungen, etwa an der oberen Knotenreihe, sowie an der Unterseite und am Mundrande braune Färbung, während sie im übrigen weißlich ist, hierin hat sie etwas Aehnlichkeit mit* T. angasi, *die aber schlanker ist; die Art scheint noch nicht bekannt zu sein. Die Schale ist ziemlich breit und etwas rundlich getürmt, die äußerste Spitze fehlt, es sind fast 11 Windungen erhalten, die sämtlich mit 3 Knotenreihen besetzt sind, die nicht sehr dicht stehen, die Knoten liegen übereinander, die letzten Windungen sind deutlich gewölbt und durch eine vertiefte Naht getrennt, die letzte ist kaum kantig, außer den 3 Knotenreihen noch mit 3 Reifen besetzt, von denen die beiden oberen noch knotig sind, der unterste umgibt die Wurzel des etwas gekrümmten Spindelfortsatzes. Mundrand vorgezogen, außen kaum knotig, unten dem Spindelfortsatz genähert, daher ist der Kanal fast geschlossen, Mündung ziemlich klein, rundlich. Höhe 7,5 mm, Durchmesser 2,25 mm.*

Translation. A single shell from Station 244; it shows again brown colour on the upper part of the whorls, on the upper row of tubercles, on the base and on the peristome. The rest is whitish, being in this respect similar to *T. angasi*, which however is more slender. This species seems not to be described yet. The shell is quite broad and rounded. The first whorl is missing, but the shell is composed by 11 whorls, that are totally covered by three rows of tubercles, which are not too dense. The tubercles are one above the other [probably meaning they are aligned vertically]. The lower whorls are clearly rounded and a deep suture separates them. The periphery at the base is a bit angulated. After the 3 tubercled spiral cords, the base has two rows of tubercles, while a faint lower thread is around the base of the bended columella. The peristome is deformed, externally weakly tubercled. The lower margin of the aperture gets very close to the columella, hence the siphonal canal looks almost closed. Aperture quite small, rounded. Height 7.5 mm, diameter 2.25 mm.

Diagnosis. The holotype is an adult specimen 7.4 mm high. Shell conical with deep sutures. Teleoconch composed by 10 whorls, protoconch missing. Teleoconch sculpture is characterized by three tubercled spiral cords since the very first whorl, the first cord is weaker on the first two-three whorls. A fine suprasutural smooth cord is also visible. The last whorl has a fourth tubercled spiral cord and the base has one more tubercled cord. The peristome has regrown after being broken off, and it is not useful for describing its diagnostic features. Ante-

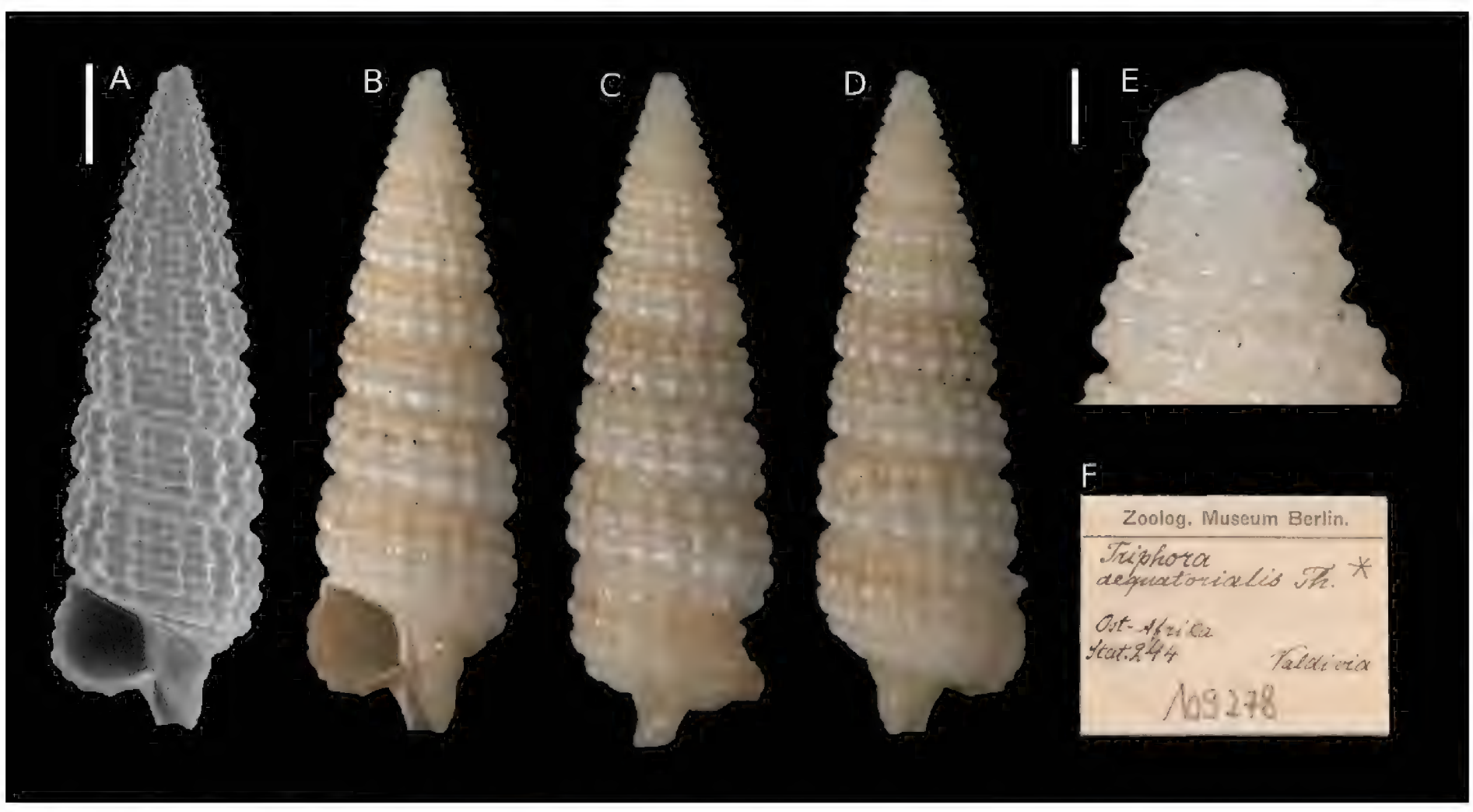

Figure 13. *Triforis aequatorialis* Thiele, 1925, Station 244 (East Africa). **A-E**. Holotype, ZMB/Moll no. 109278: front (**A-B**), left side (**C**), back (**D**), protoconch (**E**). **F**. Original label. Scale bar: **A-D**: 1 mm, **E**: 0.2 mm.

rior siphonal canal quite long. Colour whitish, with a faint light brown band as background colour of the first cord. Tubercles usually lighter and whiter than the background colour.

Remarks. The apex is missing, but the size of the first teleoconch whorl suggests a multispiral apex.

Triphora aethiopica Thiele, 1925

Figure 14

Triphora aethiopica Thiele, 1925: 131 (97), plate XXII (X), figure 25.

Type specimens. Holotype: ZMB/Moll no. 109276, fixed by monotypy.

Type locality. "Station 244 [5°55.8' südl. Br., 39°1.2' östl. L., 50 m Tiefe, bei Ost-afrika]" (off Zanzibar, East Africa).

Original description. *Eine Schale von Station 244 gehört in dieselbe Gruppe wie die vorigen Arten [*Triphora sceptrum*], von Denen sie sich durch beträchtlich geringere Größe unterscheidet, ihre Anfangswindungen sind ähnlich wie bei* T. regia*, deren Skulptur bedeutend gröber ist;* T. concatenata *Melv. (Proc. malac. Soc. London, v. 6 p. 162 t. 10 f. 9) aus dem Golf von Oman ist auch ähnlich, doch soll diese nur einen Kiel auf den braunen Anfangswindungen haben. Die äußerste Spitze (etwa 1-2 Windungen) fehlt, es sind etwa 16 erhalten, die zuletzt kaum zunehmen und ein hoch getürmtes Gehäuse bilden. Die ersten sind gelbbraun, mit 2 ziemlich entfernten Reifen und herablaufenden Fäden skulptiert, die folgenden sind weißlich, stark glänzend, mit einem etwas knotigen Reifen unter der Naht und 2 gleichstarken Reihen etwas zusammengedrückter Knoten von mäßiger Größe, die grade übereinander liegen. Die letzte Windung hat an der unteren scharfen Kante einen kantigen Reifen und an der stark eingezogenen Unterseite noch 2 Reifen. Spindelfortsatz etwas gekrümmt. Der Mundrand ist etwas beschädigt. Höhe 6,25 mm, Durchmesser 1,25 mm.*

Translation. A single shell from Station 244 belongs to the same group as the previous species [*Triphora sceptrum*], from which it differs by its considerably smaller size, the apex is similar to the one of *T. regia*, whose sculpture is much coarser; *T. concatenata* Melv. (Proc. malac. Soc. London, v. 6 p. 162 t. 10 f. 9) from the Gulf of Oman is also similar, but this species has only one keel on the apex. The first few whorls (about 1-2 whorls) of the protoconch are missing, there are about 16 whorls, the last ones are slightly larger and form a slender shell. The first whorls [apex] are yellowish-brown, with two spiral keels and axial riblets, the following whorls are whitish, very shiny, with a slightly tubercled cord under the suture and two cords of equal size with compressed tubercles of moderate size, which lie just one above the other. The last whorl is angulated, and on the base there are two strongly drawn cords. The siphonal canal is slightly curved. The aperture is slightly damaged. Height 6.25 mm, diameter 1.25 mm.

Diagnosis. Holotype height 6.4 mm. Shell very slender, conical, with flat whorls. Teleoconch of 12 whorls, which have three tubercled spiral cords; the first is present since the first teleoconch whorl, and always smaller than the other two. Last whorl with a fourth weakly tubercled spiral cord while the base has two finer and smoother cords. Multispiral apex of at least three whorls, but the very first ones are missing; the protoconch whorls bear two strong keels and axial riblets. Teleoconch colour white, whereas the protoconch is yellowish; however, both colours may be faded, because the holotype was dead collected.

Triphora albina Thiele, 1930

Figure 15

Triphora albina Thiele, 1930: 577-578, plate IV, figure 39.

Type specimens. Lectotype: ZMB/Moll no. 67494a, here designated. Paralectotypes A-B: ZMB/Moll no. 67494b-c.

Type locality. "Station 1 (Sharks Bay)" (Western Australia).

Original description. *Eine Schale von Station 1 (Sharks Bay) ist weiß, die Embryonalschale bräunlich, mit 4½ kantigen und mit herablaufenden Fäden skulptierten Windungen, die folgenden 6 Windungen langsam zunehmend, anfangs mit 2, dann mit 3 Knotenreihen, Endwindung nach unten verschmälert und abgerundet, hier mit 3 Reifen, Mündung ziemlich schmal, oben spitzwinklig. Höhe 2,6 mm, Durchmesser 0,8 mm.*

Translation. One shell from Station 1 (Shark Bay) is white, the protoconch whorls brownish, of 4½ whorls with a spiral keel and axial riblets; the following 6 whorls slowly increase in size and have two tubercled cords at the beginning, which later become three; the base is rounded, with three threads; aperture rather narrow, with an acute angle on the upper part. Height 2.6 mm, diameter 0.8 mm.

Diagnosis. Lectotype height 2.6 mm. Shell pupoid, with flat whorls. Teleoconch of six whorls, which have three tubercled spiral cords. The second cord develops later and is fully visible from the fourth row. A fine suprasutural smooth cord also present. The last whorl has a fourth weakly tubercled spiral cord. The base has two more spiral cords: one is weakly tubercled, while the other is smooth. Peristome with a posterior sinus. Multispiral apex of five whorls: the first is smooth, while the others bear a single strong keel and axial riblets. Teleoconch white, apex white to light brownish.

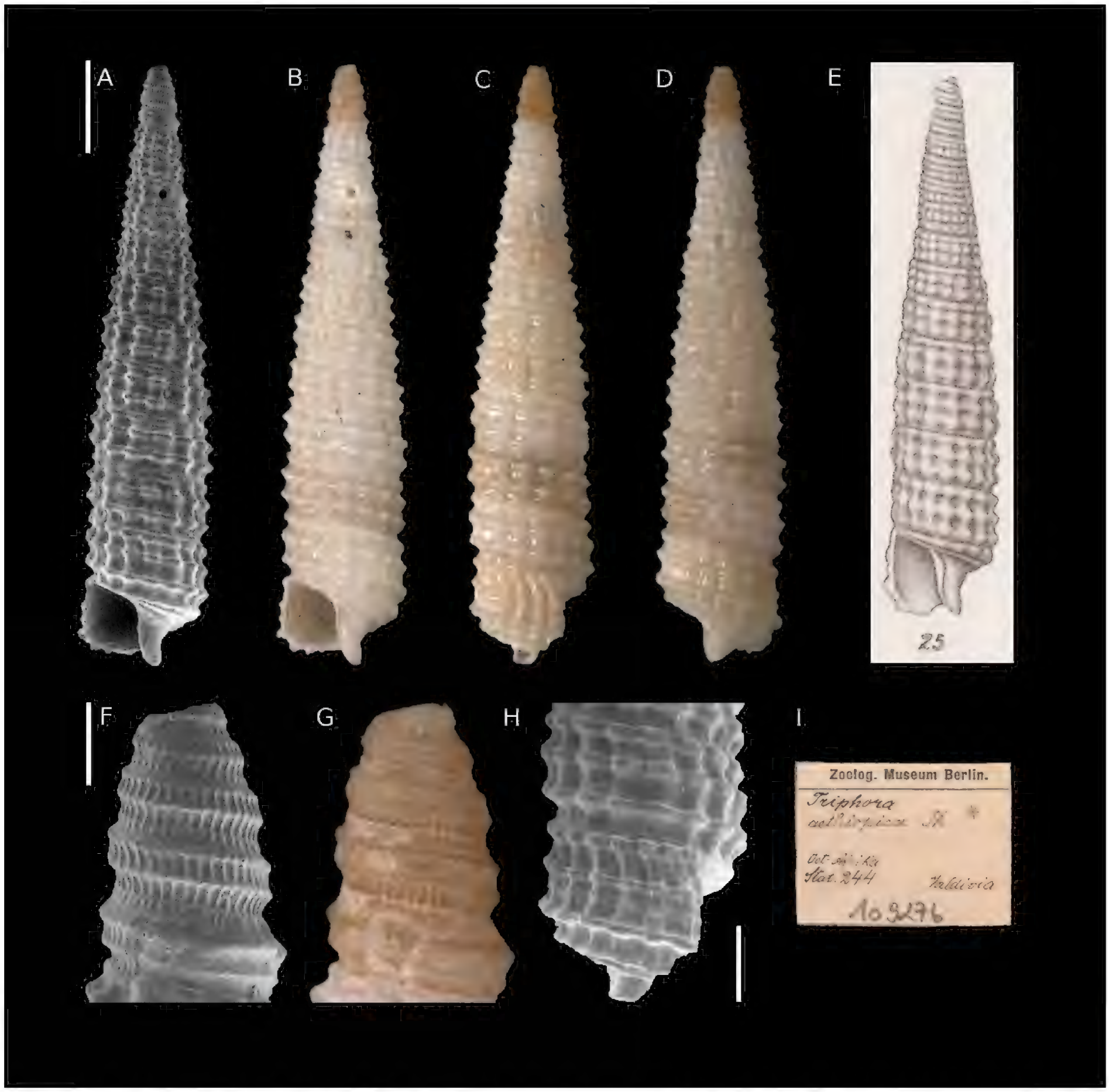

Figure 14. *Triphora aethiopica* Thiele, 1925, Station 244 (5°55.8'S, 39°1.2'E, 50 m depth, off East Africa). **A-D**, **F-H**. Holotype, ZMB/Moll no. 109276: front (**A-B**), side (**C**), back (**D**), protoconch (**F-G**), peristome (**H**). **E**. Original figure in Thiele 1925. **I**. Original label. Scale bar: **A-D**: 1 mm, **F-G**: 0.2 mm, **H**: 0.5 mm.

Triphora alboapicata Thiele, 1930

Figure 16
Triphora alboapicata Thiele, 1930: 577, plate IV, figure 35.

Type specimens. Holotype: ZMB/Moll no. 67490, fixed by monotypy.

Type locality. "Station 3 (Sharks Bay)" (Western Australia).

Original description. *Eine schale von Station 3 (Sharks Bay) ist durch ihre anfangs weiße, nachher schwarze Färbung ausgezeichnet. Die aus 2½ Windungen bestehende Embryonalschale ist oben stumpf, dann etwas kantig, die herablaufenden Fäden sind undeutlich; die folgenden 8 Windungen haben 2 Knotenreihen, zwischen die sich auf den unteren Windungen allmählich noch eine dritte Reihe einschiebt, die Endwindung hat 6 Reihen; die Mündung ist oben spitzwinklig. Höhe 4 mm, Durchmesser 1,3 mm.*

Translation. One shell from Station 3 (Shark Bay) is in its starting whorls white, while the lower whorls are black. The first 2½ embryonic whorls are not pointed, a bit angulated, the axial sculpture is unclear; the following

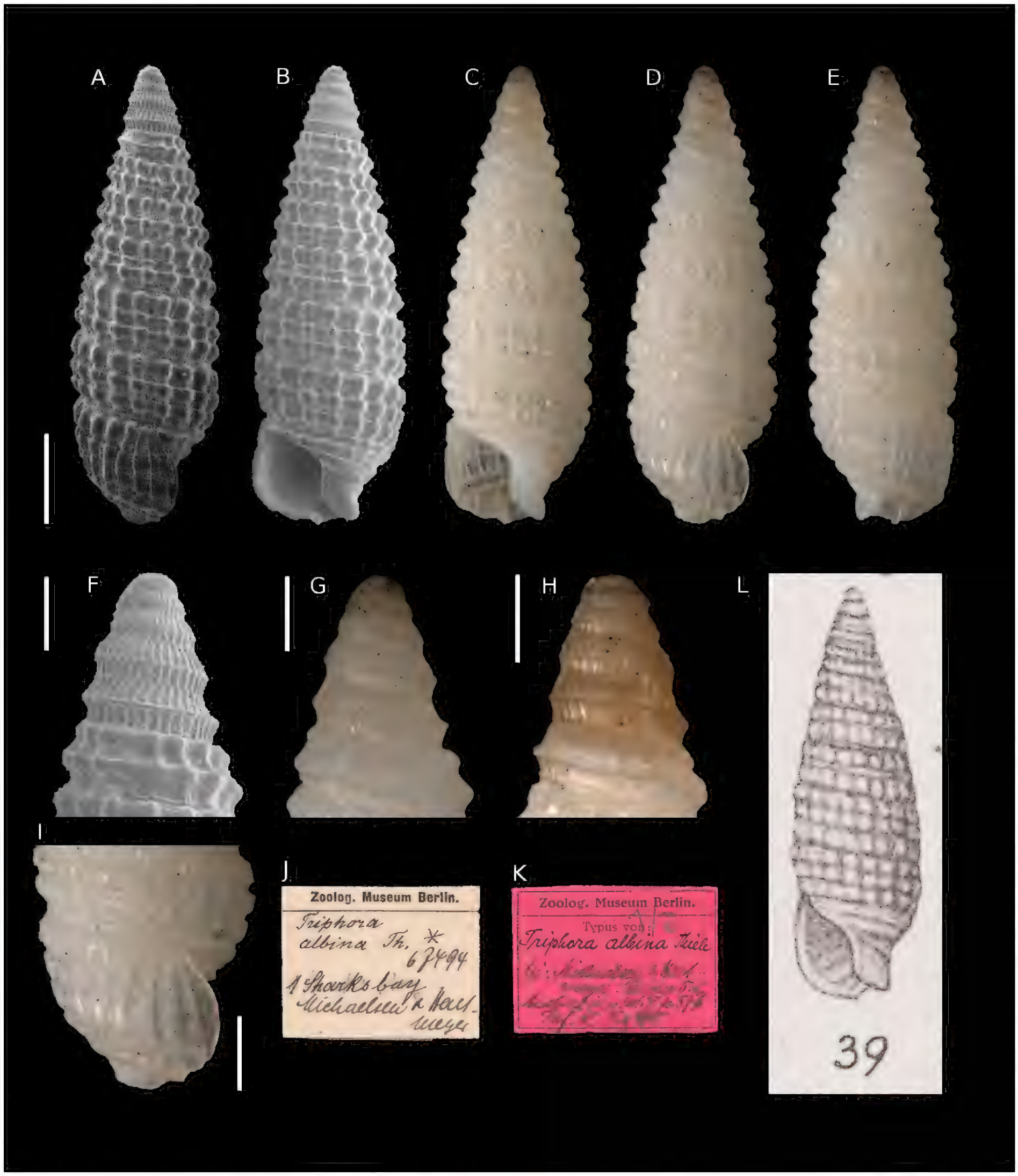

Figure 15. *Triphora albina* Thiele, 1930, Station 1 (Shark Bay). **A-G**, **I**. Lectotype, ZMB/Moll no. 67494a: left side (**A, D**), front (**B-C**), back (**E**), protoconch (**F-G**), peristome (**I**). **H**. Paralectotype B, ZMB/Moll no. 67494b: protoconch. **J-K**. Original labels. **L**. Original figure in Thiele 1930. Scale bar: **A-E**: 0.5 mm, **F-H**: 0.2 mm, **I**: 0.3 mm.

eight whorls have two rows of tubercles, gradually a third cord develops on the lower whorls, between the first two; the last whorl has six threads; the aperture has an acute angle on the upper part. Height 4 mm, diameter 1.3 mm.

Diagnosis. Holotype height 4.0 mm. Shell pupoid. The teleoconch has seven flat whorls, which have three tubercled spiral cords; the second cord appears later along the spire, and is visible on the sixth whorl and well developed only on the last one. A very fine suprasutural cord also present. The last whorl has a fourth tubercled cord. The base has

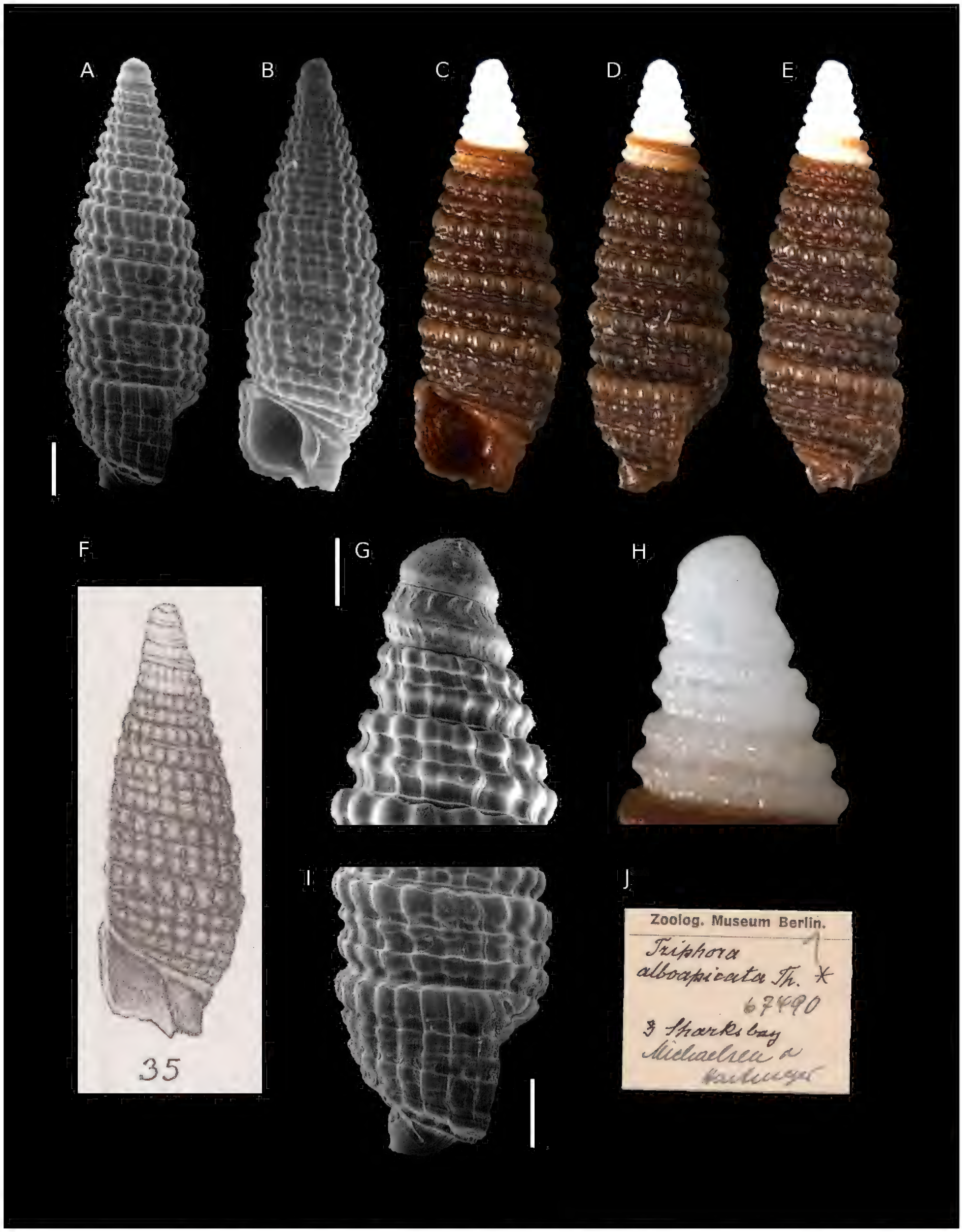

Figure 16. *Triphora albopicata* Thiele, 1930, Station 3 (Shark Bay). **A-E**, **G-I**. Holotype, ZMB/Moll no. 67490: left side (**A, D**), front (**B-C**), back (**E**), protoconch (**G-H**), peristome (**I**). **F**. Original figure in Thiele 1925. **J**. Original label. Scale bar: **A-E**: 0.5 mm, **G-I**: 0.2 mm, **H**: 0.4 mm.

two spiral cords: the first is tubercled, while the second is almost smooth. On the peristome, additional spiral cords appear between the main ones. Paucispiral apex of two whorls; the first whorl has a keel on the periphery, while on the second, axial riblets are also present. Teleoconch dark brown, protoconch and the first two whorls white.

Triphora brunnescens Thiele, 1930

Figure 17
Triphora brunnescens Thiele, 1930: 577, plate IV, figure 36.

Type specimens. Lectotype: ZMB/Moll no. 67491a, here designated. Paralectotype A: ZMB/Moll no. 67491b.

Type locality. "Stationen 16 und 20 (Sharks Bay)" (Western Australia).

Original description. *Ein Paar Schalen von den Stationen 16 und 20 (Sharks Bay) sind hellbräunlich, spitz, turmförmig, mit etwa 15 langsam und gleichmäßig zunehmenden Windungen, von denen die 5 Embryonalwindungen mit 2 Spiralfäden und herablaufenden Fäden, die folgenden mit 3 Knotenreihen skulptiert sind, die Endwindung hat unten 3 glatte Reifen, der Spindelfortsatz ist kurz, die Mündung oben spitzwinklig. Höhe 5 mm, Durchmesser 1,3 mm, andere Schalen sind nur 3,25 mm hoch.*

Translation. Two shells from the stations 16 and 20 (Shark Bay), which are light brown of colour, pointed, slender, with about 15 slowly and steadily increasing whorls, of which the 5 embryonic whorls have 2 spiral keels and axial riblets; the following whorls are sculptured with 3 tubercled cords; the last whorl has 3 smooth cords on the base; the siphonal canal is short, the aperture has an acute angle in the upper part. Height 5 mm, diameter 1.3 mm, other shells are only 3.25 mm high.

Diagnosis. Lectotype height 5.1 mm. Shell conical, with flat whorls. Teleoconch of 11 whorls. Paralectotype is 3.3 mm high and has eight whorls. Teleoconch whorls have three tubercled spiral cords, well visible since the first whorl. A fine suprasutural smooth cord is also present. The last whorl has a fourth tubercled spiral cord, and the base further two, but smooth. The peristome has a posterior sinus. The protoconch is broken and lacks the very first whorls, but it is clearly multispiral: three whorls are clearly visible and are ornamented by two spiral keels and axial riblets. Protoconch light brown. The teleoconch has the first whorl white, then it is brown until the sixth row; the lower whorls have the first row of tubercles light brown, while the other two are white. Base light brown.

Remarks. The lectotype and paralectotype are both fully mature, but show significantly different sizes, 5.1 and 3.3 mm respectively, as observed in several other species (Marshall 1983).

Triphora castaneofusca Thiele, 1930

Figure 18
Triphora castaneofusca Thiele, 1930: 576-577, plate IV, figure 33.

Type specimens. Holotype: ZMB/Moll no. 67451, fixed by monotypy.

Type locality. "Station 3 (Sharks Bay)" (Western Australia).

Original description. *Eine noch nicht ganz ausgewachsene Schale von Station 3 (Sharks Bay) ist ziemlich groß, einfarbig kastanienbraun, mit etwa 15 gleichmäßig zunehmenden Windungen, ihre Embryonalschale zeigt die typische Skulptur mit 2 Spiralfäden, die von herablaufenden Fäden gekreuzt werden, während die folgenden Windungen mit 3 Knotenreihen skulptiert sind, die Endwindung hat an der unteren Kante noch einen Reifen und 3 glatte Reifen an der Unterseite. Höhe 7 mm, Durchmesser 2,3 mm.*

Translation. A not fully grown shell from station 3 (Shark Bay) which is pretty large, brown in colour, with about 15 evenly increasing whorls; the protoconch shows the typical sculpture of two spiral keels, which are crossed by axial riblets, while the following whorls are sculptured with three cords of tubercles, the last whorl has on the base another tubercled cord and three smooth cords. Height 7 mm, diameter 2.3 mm.

Diagnosis. Holotype height 7.0 mm. Shape of the shell initially conical; the last two whorls are inflated, but this shape may not be typical: it may be due to a failed predatory attempt and shell regrowth. Teleoconch of 10 whorls, which have three tubercled spiral cords; the first cord appears on the second whorl. A fine barely visible suprasutural smooth cord is also present. A fourth slightly tubercled spiral cord is present on the last whorl, and three further almost smooth cords are present on the base. Peristome not fully developed, because the specimen is sub-adult. Only the last whorl of the protoconch is present; due to its size, it is likely multispiral. It bears two keels and axial riblets. Colour brown; tubercles lighter on the lower half of the shell.

Triforis crassula Martens, E. von, 1880

Figure 19
Triforis crassula Martens, E. von, 1880: 282, plate XXII, figure 1.

Type specimens. Lectotype: ZMB/Moll no. 31774a, here designated. Paralectotypes A-D: ZMB/Moll no. 31774b-e.

Type locality. "Mauritius, im Sand".

Original description. *Testa ventricosa, conico-ovata, granulis supra suturam biseriatis, fusconigricans, apice pallide flavescente; anfr. circa 6, sat celeriter crescents,*

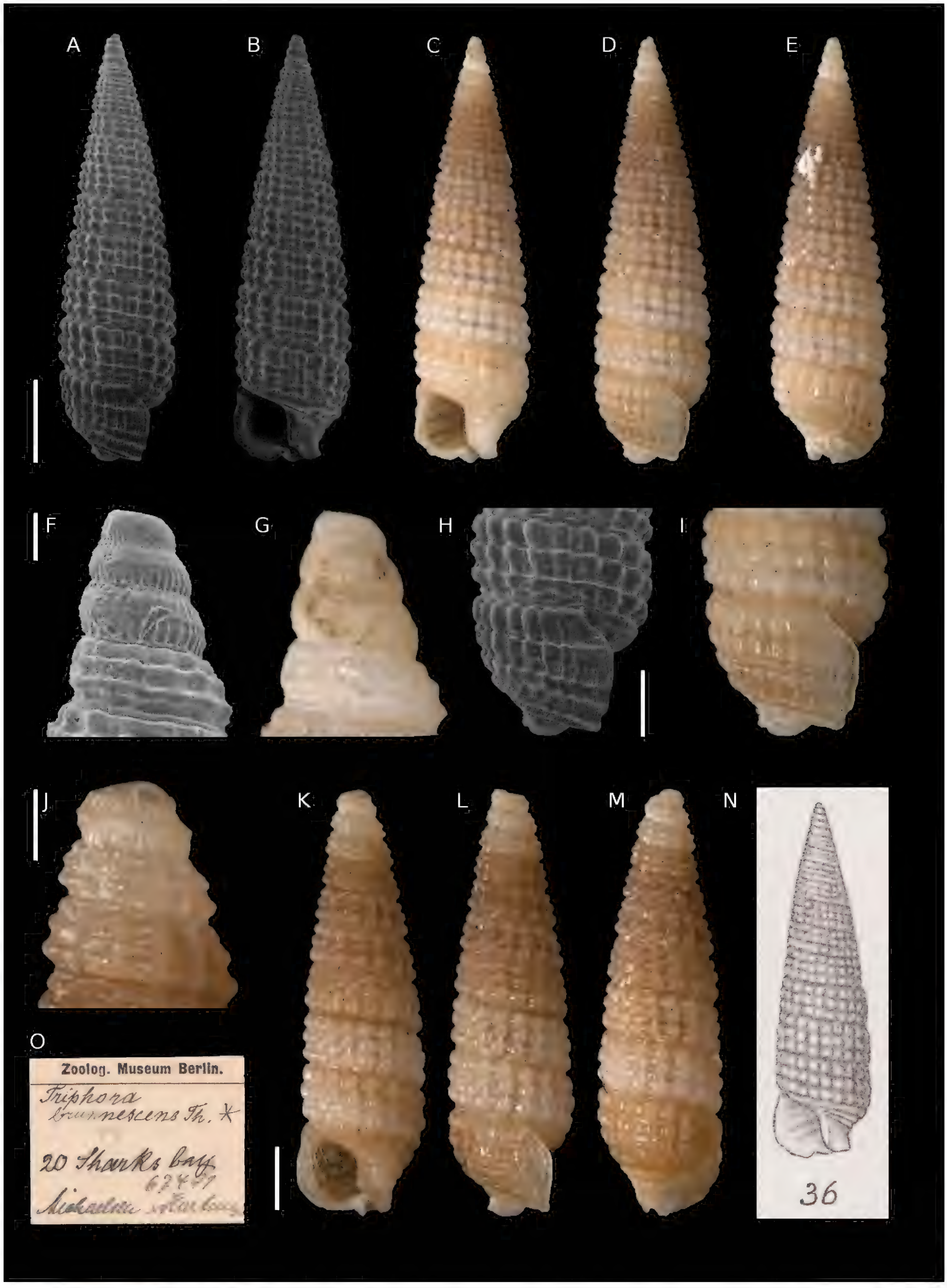

Figure 17. *Triphora brunnescens* Thiele, 1930, stations 16 and 20 (Shark Bay). **A-I**. Lectotype, ZMB/Moll no. 67491a: left side (**A, D**), front (**B-C**), back (**E**), protoconch (**F-G**), peristome (**H-I**). **J-M**. Paralectotype A, ZMB/Moll no. 67491b: protoconch (**J**), front (**K**), side (**L**), back (**M**). **N**. Original figure in Thiele 1930. **O**. Original label. Scale bar: **A-E**: 1 mm, **F-G**: 0.1 mm, **H-I**: 0.5 mm, **J**: 0.2 mm, **K-M**: 1 mm.

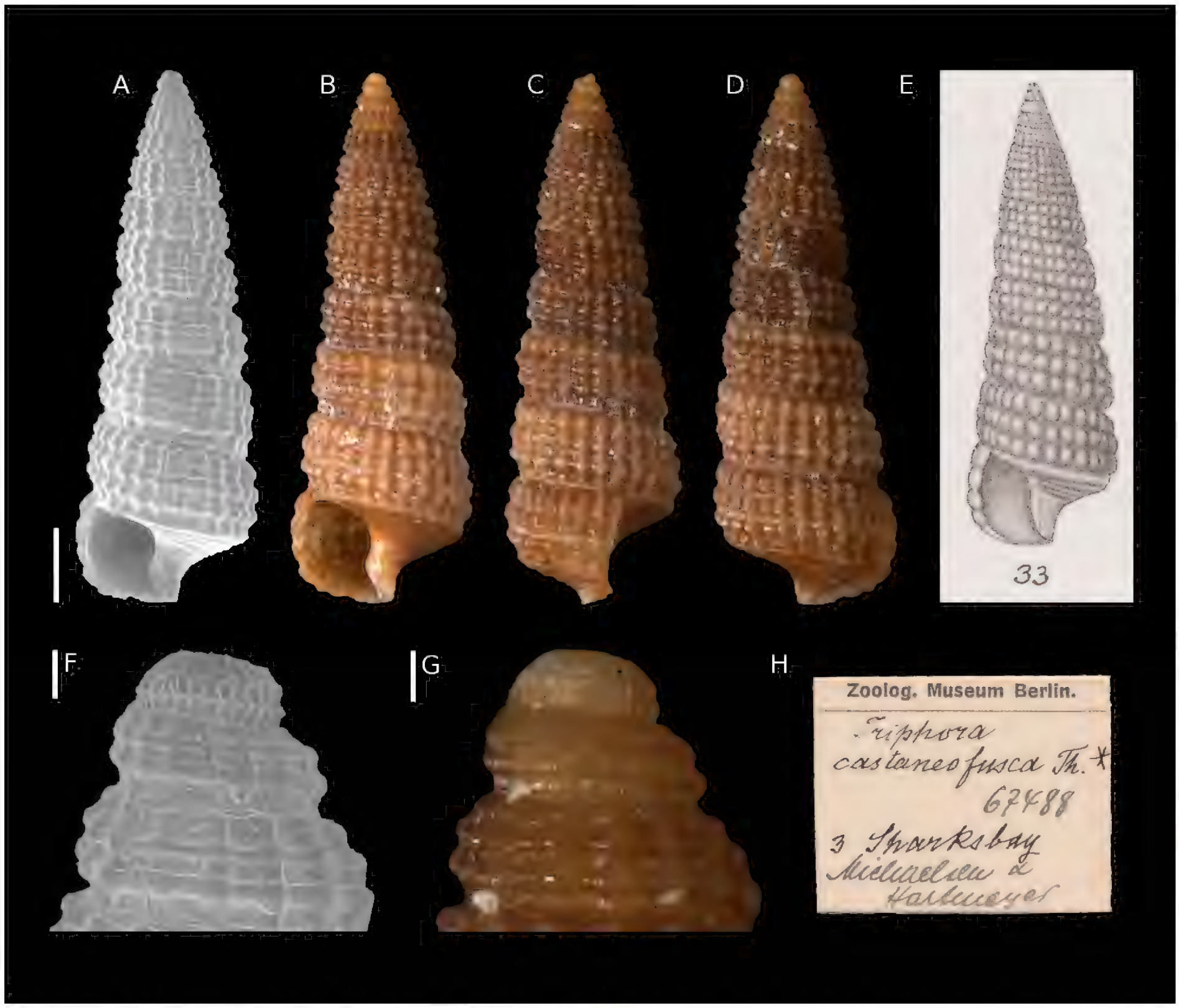

Figure 18. *Triphora castaneofusca* Thiele, 1930, Station 3 (Shark Bay). **A-D**, **F-G**. Holotype, ZMB/Moll no. 67488: front (**A-B**), left side (**C**), back (**D**), protoconch (**F-G**). **E**. Original figure in Thiele 1925. **H**. Original label. Scale bar: **A-D**: 1 mm, **F-G**: 0.1 mm.

ultimus angustus, basi liris circa 3 granosis cinctus, apertura parva, simplice.

Long. 2½, diam. 1⅓, apert. ⅔ mm.

Mauritius, im Sand, Prof. Möbius.

Der obere Gürtel ist öfters heller gefärbt, aschgrau. Obgleich nur unvollkommene Exemplare vorliegen, so ist der Gesammthabitus doch so eigenthümlich, dass ich ihnen einen Artnamen nicht versagen wollte. Nächstverwandt sind Trif. pupaeformis *Desh. moll. de Reunion pl. 12, fig. 3, 4, welche durch die helle Färbung und die ungekörnte Basis sich unterscheidet, und* T. atomus *Issel malacologia del mar rosso pl. 4, Fig. 4, p. 280 fossil und noch kleiner, 1½ mm lang, ¾ breit.*

Translation. Inflated shell, ovate cone shaped, with two series of tubercles above the suture, deep brown with apex light yellowish; approximately 6 whorls, which grow fast, the last whorl is smaller, the base has 3 tubercled spiral cords, the aperture is small and simple. Length 2½ mm, diameter 1⅓ mm, aperture ⅔ mm. Mauritius, in sand, Prof. Möbius. The first thread is often light ash-grey of colour. Although, only imperfect specimens are present, the overall look of the specimens are so unusual, that I could not leave them without a name. Related species are *T. pupaeformis* Desh. (Moll. de Reunion pl. 12, fig. 3, 4), which is distinguishable by its light colouring and base without tubercles, and *T. atomus* Issel (Malacologia del Mar Rosso pl. 4, fig. 4, p. 280) which is a fossil species and even smaller, 1½ mm in length and ¾ in width.

Diagnosis. Lectotype height 2.4 mm. Shell oval, with the last whorl of smaller diameter than the penultimate one. Teleoconch of six whorls, which have two tubercled spiral cords; a fine spiral microsculpture is present between the cords (Fig. 19 D). A third tubercled spiral cord present on the last whorl. The base with two further smooth spiral cords. Whorls rather flat. Due to the overall bad conditions of the specimens, it is not easy to

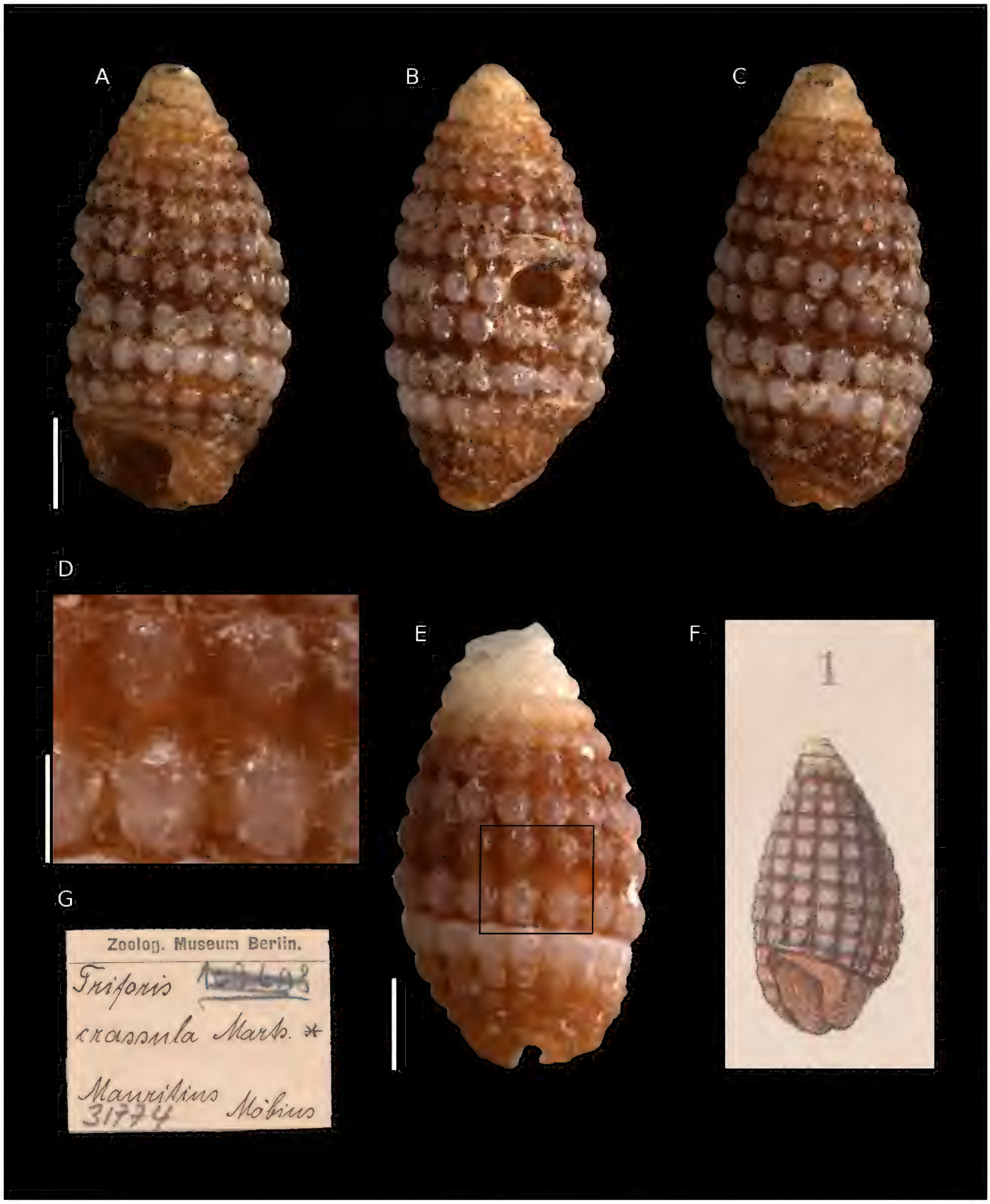

Figure 19. *Triphora crassula* von Martens, 1880, Mauritius. **A-C**. Lectotype, ZMB/Moll no. 31774a: front (**A**), side (**B**), back (**C**). **D-E**. Paralectotype C, ZMB/Moll no. 31774d: microsculpture (**D**), back (**E**). **F**. Original figure in von Martens 1880. **G**. Original label. Scale bar: **A-C**: 0.5 mm, **D**: 0.2 mm, **E**: 0.4 mm.

observe the peristome, which, however, seems to have additional spiral cords. The apex is missing. The first teleoconch whorls are yellowish; the rest of the shell is brown with grey tubercles.

Remarks. The lot contains also two triphorid specimens belonging to a distinctly different species, and five cerithiopsids, all quite worn.

Triphora dives Thiele, 1925

Figure 20
Triphora dives Thiele, 1925: 130 (96), plate XXII (X), figure 22.

Type specimens. Holotype: ZMB/Moll no. 109273, fixed by monotypy.

Type locality. "Station 244 (5°55.8' südl. Br., 39°1.2' östl. L., 50 m Tiefe, bei Ost-Afrika)" (off Zanzibar, East Africa).

Original description. *Eine Schale von Station 244 (5°55,8' südl. Br., 39°1.2' östl. L., 50 m Tiefe, bei Ost-Afrika) gehört zu einer ausgezeichneten neuen Art, sie ist lang kegelförmig, etwas gelblich, in den Kerben der Spiralreifen undeutlich braun gefärbt.*

Die äußerste Spitze ist abgebrochen, 16 Windungen sind vorhanden, die gleichmäßig zunehmen, die glänzende Oberfläche zeigt feine und dichte Spirallinien und 4 wellige kielartige Reifen, von denen der zweite und der über der Naht sichtbare vierte nur schwach, der dritte am stärksten ist, seine Entfernung vom zweiten ist am größten, in den Zwischenräumen sind niedrige und breite herablaufende Falten vorhanden. Bei der letzten Windung verstärkt sich der unterste Reifen zu einer deutlichen Kante, unter der die Schale plötzlich stark eingeschnürt ist, an der Unterseite ist noch ein ziemlich starker, braun gegliederter Reifen vorhanden, Spindelfortsatz sehr schräg. Mundrand vorgezogen, auf ihm hat sich in der Mitte zwischen den auseinandergehenden 2. und 3. Reifen noch einer eingeschoben. Höhe 13,5 mm, Durchmesser etwa 3,5 mm.

Translation. One shell from station 244 (5°55.8'S, 39°1.2'E, 50 m depth, off East Africa) belongs to an undescribed new species, it is long and conical in shape, a bit yellowish, with a faint brown colour between the tubercles of the spiral cords. The protoconch is missing; the shell has 16 whorls, which regularly increase in size, the glossy surface has fine and dense spiral cords and four strong keeled threads, of which the second and the fourth are less prominent, the third keeled cord is the most prominent, and there is a large distance between the second and third cord; in the interspaces between the cords there are wide axial ribs. On the last whorl, the lowest cord forms a sharp edge, under which the base suddenly constricts; on the base there is another spiral cord with faint brown colour between the tubercles; the siphonal canal is very oblique. The peristome is expanded, and it bears an additional spiral cord between the second and third cord. Height 13.5 mm, diameter 3.5 mm.

Diagnosis. Holotype height 13.1 mm. Shell slender, conical, with flat whorls. The teleoconch has 16 whorls, but the apex is broken and it may have a few more whorls. Teleoconch whorls have three sharp weakly tubercled spiral cords; the second develops later along the spire, on the fifth whorl. A fine suprasutural smooth cord is also present. The last whorl has a prominent fourth sharp and weakly tubercled cord, the profile of the last whorl is much angulated. The base has a further weakly tubercled spiral cord. The peristome has a posterior pallial sinus and has an additional spiral cord between the second and the third. Protoconch missing in the holotype. Colour yellowish-light brown, but the specimen was collected dead, and the colours may have faded away.

Triphora elata Thiele, 1930

Figure 21
Triphora elata Thiele, 1930: 577, plate IV, figure 37.

Type specimens. Holotype: ZMB/Moll no. 67492, fixed by monotypy.

Type locality. "Station 25 (Sharks Bay)" (Western Australia).

Original description. *Eine Schale von Station 25 (Sharks Bay) ist schlank getürmt, kastanienbraun, mit 15 langsam und gleichmäßig zunehmenden Windungen, die embryonalen zeigen eine Mittelkante und herablaufende Fäden, die folgenden 2 Knotenreihen, zwischen die sich weiterhin ein allmählich stärker und knotig werdender Spiralfaden einschiebt, die Endwindung hat unten 2 glatte Reifen. Höhe 4,3 mm, Durchmesser 1 mm.*

Translation. One shell from station 25 (Shark Bay) is slender, brown, with 15 whorls which slowly but regularly increase in size, the protoconch has a single spiral keel and axial riblets; the following teleoconch whorls have two rows of tubercles, a third row develops between the first and second row, which gradually becomes stronger on lower whorls; on the base there are two smooth spiral cords. Height 4.3 mm, diameter 1 mm.

Diagnosis. Holotype height 4.0 mm. Shell conical. The teleoconch has nine whorls, with three tubercled spiral cords; the second cord develops later along the spire and is well visible only on the penultimate whorl. A fine suprasutural smooth cord is also present. The last whorl has a fourth smooth spiral cord and the base has one further smooth cord. Peristome missing. Also the protoconch is incomplete, but clearly multispiral; on the three visible whorls there is a single sharp keel and axial riblets. Colour brown, the first row of tubercles is lighter, almost grey.

Triforis fusca Dunker, 1860

Figure 22
Triforis fusca Dunker, 1860: 237; figured in Dunker 1861: 10, plate 2, figure 22.

Type specimens. Lectotype: ZMB/Moll no. 101922a (designated by Marshall (1983)). Paralectotype: ZMB/Moll no. 101922b. Further paralectotypes: SMF no. 304814 (Janssen, 1993).

Figure 20. *Triforis dives* Thiele, 1925, Station 244 (5°55.8'S, 39°1.2'E, 50 m depth, off East Africa). **A-E**. Holotype, ZMB/Moll no. 109273: front (**A**), side (**B**), back (**C**), peristome (**D-E**). **F**. Original label. **G**. Original figure in Thiele 1925. Scale bar: **A-C**: 2 mm, **D-E**: 1 mm.

Type locality. Japan.

Original description. *T. testa solidula, fusca, gracili, in medio paullulum ventrosa; anfractibus 12 – 14 sutura distincta divisis, triseriatim granosis; serie intermedia angustiore obsoleta; granulis confertis ex parte confluentibus. – Alt. 10 – 11, lat. 2 mill. Alle vorliegenden Exemplare sind einfarbig dunkelbraun und in ihrer Skulptur ganz übereinstimmend.*

Translation. Solid, dark, slender shell, in the middle slightly inflated; 12-14 whorls divided by a deep suture

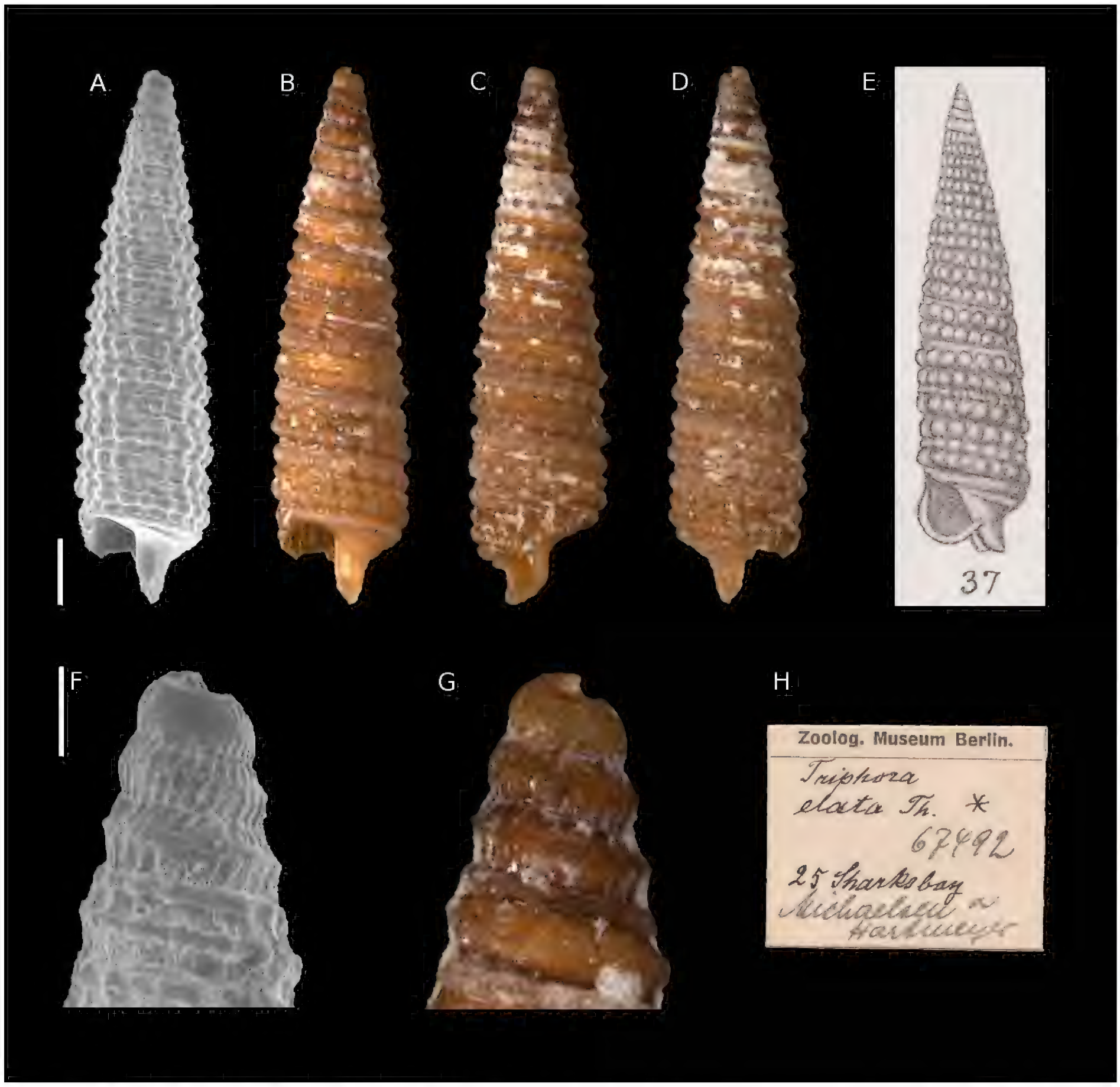

Figure 21. *Triphora elata* Thiele, 1930, Station 25 (Shark Bay). **A-D**, **F-G**. Holotype, ZMB/Moll no. 67492: front (**A-B**), left side (**C**), back (**D**), protoconch (**F-G**). **E**. Original figure in Thiele 1930. **H**. Original label. Scale bar: **A-D**: 0.5 mm, **F-G**: 0.2 mm.

with three rows of tubercles; the second row less developed; the granules are close on the side of the confluence [it may refer to the fact that the second row of tubercles is closer to the first row]. All specimens are monochrome dark brown of colour and the sculpture is of the same colour tone.

Diagnosis. Lectotype height 7.6 mm. Conical shell with flat sides. Teleoconch of at least 10 whorls, with three tubercled spiral cords; the second is visible only on the eighth whorl. A fine suprasutural smooth cord is also present. The last whorl has a fourth smooth spiral cord, and the base bears two more smooth cords. The peristome has additional spiral cords among the main ones, a character well visible in the paralectotype, while the lectotype has the peristome rebuilt after breakage and its sculpture is not reliable. Apex missing in both available specimens, hence the shape and sculpture of the protoconch cannot be described. Brown in colour.

Metaxia fuscoapicata Thiele, 1930

Figure 23
Metaxia fuscoapicata Thiele, 1930: 575, plate IV, figure 26.

Type specimens. Holotype: ZMB/Moll no. 67481, fixed by monotypy.

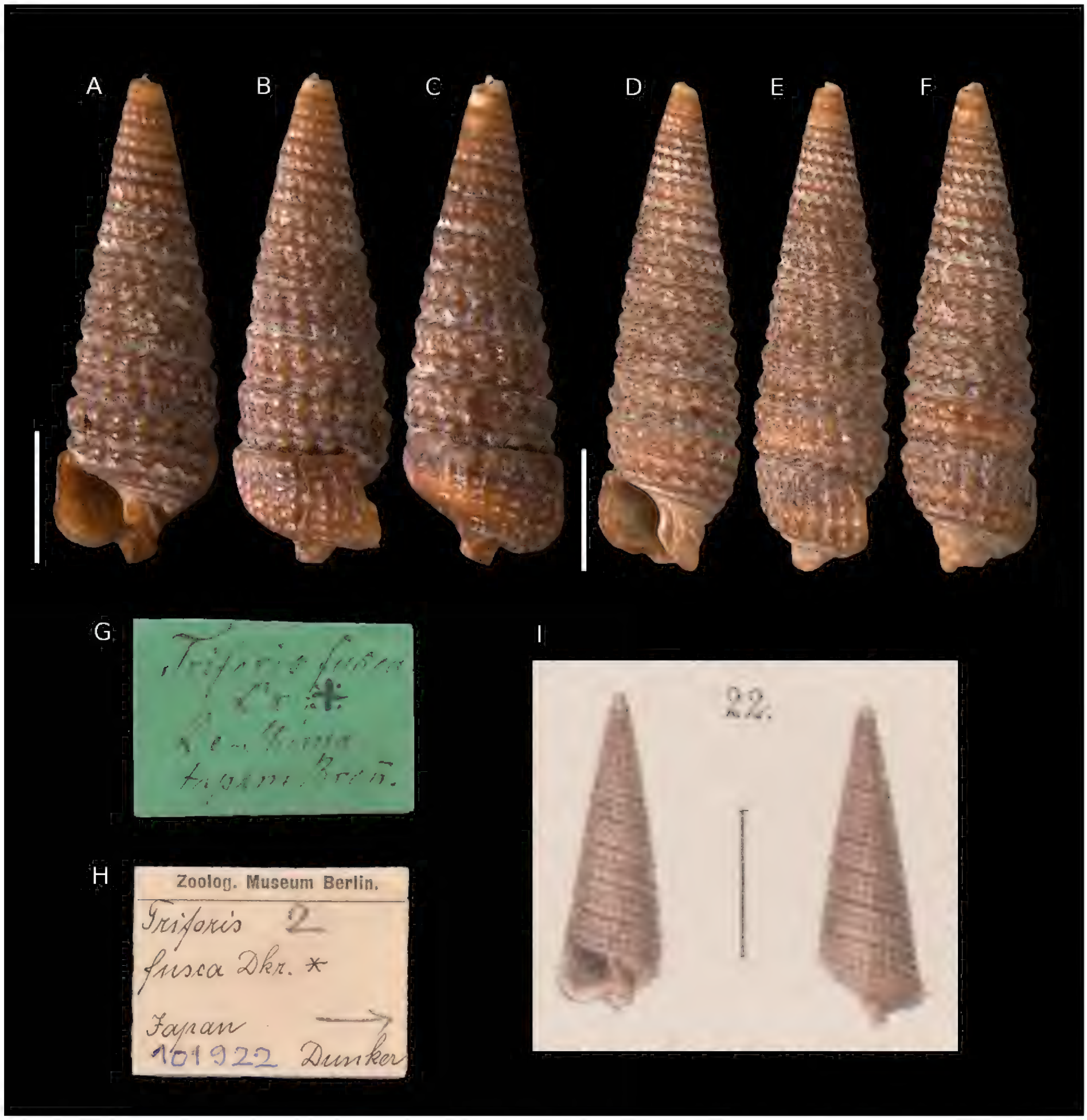

Figure 22. *Triforis fusca* Dunker, 1860, Japan. **A-C**. Lectotype, ZMB/Moll no. 101922: front (**A**), left side (**B**), back (**C**). **D-F**, Paralectotype, ZMB/Moll no. 101922: front (**D**), left side (E), back (**F**). **G**. Original label by Dunker. **H**. Original museum label. **I**. Original figure in a later publication by Dunker (1861). Scale bar: **A-F**: 2 mm.

Type locality. "Station 10 (Sharks Bay)" [Western Australia].

Original description. *Eine wahrscheinlich junge Schale von Station 10 (Sharks Bay) ist durch ihre braune, aus 4 kaum zunehmenden, etwas rauhen Windungen bestehende Embryonalschale ausgezeichnet, von der sich die folgenden farblosen Windungen scharf absetzen; diese, von denen 5 vorhanden sind, haben 4 starke Spiralreifen und einige breite, wellen förmige Rippenfalten, sie sind deutlich gewölbt und in der Mitte etwas kantig; Spindelfortsatz kurz, untere Bucht der Mündung breit. Höhe 2,4 mm, Durchmesser 0,65 mm.*

Translation. A probably young shell from Station 10 (Shark Bay) is characterized by an embryonal shell composed of almost 4 brown whorls. The teleoconch whorls are without colour and start after the larval shell abruptly. The teleoconch is composed of 5 clearly convex whorls with an angulated profile. The whorls have 4 strong spiral cords and some broad, wave-like, axial ribs. The columella is short, the siphonal canal broad. Height 2.4 mm, diameter 0.65 mm.

Diagnosis. Shell dextrally coiled. Holotype 2.4 mm high, teleoconch composed of five whorls; however, this specimen is likely a subadult. Whorls have eight orthocline

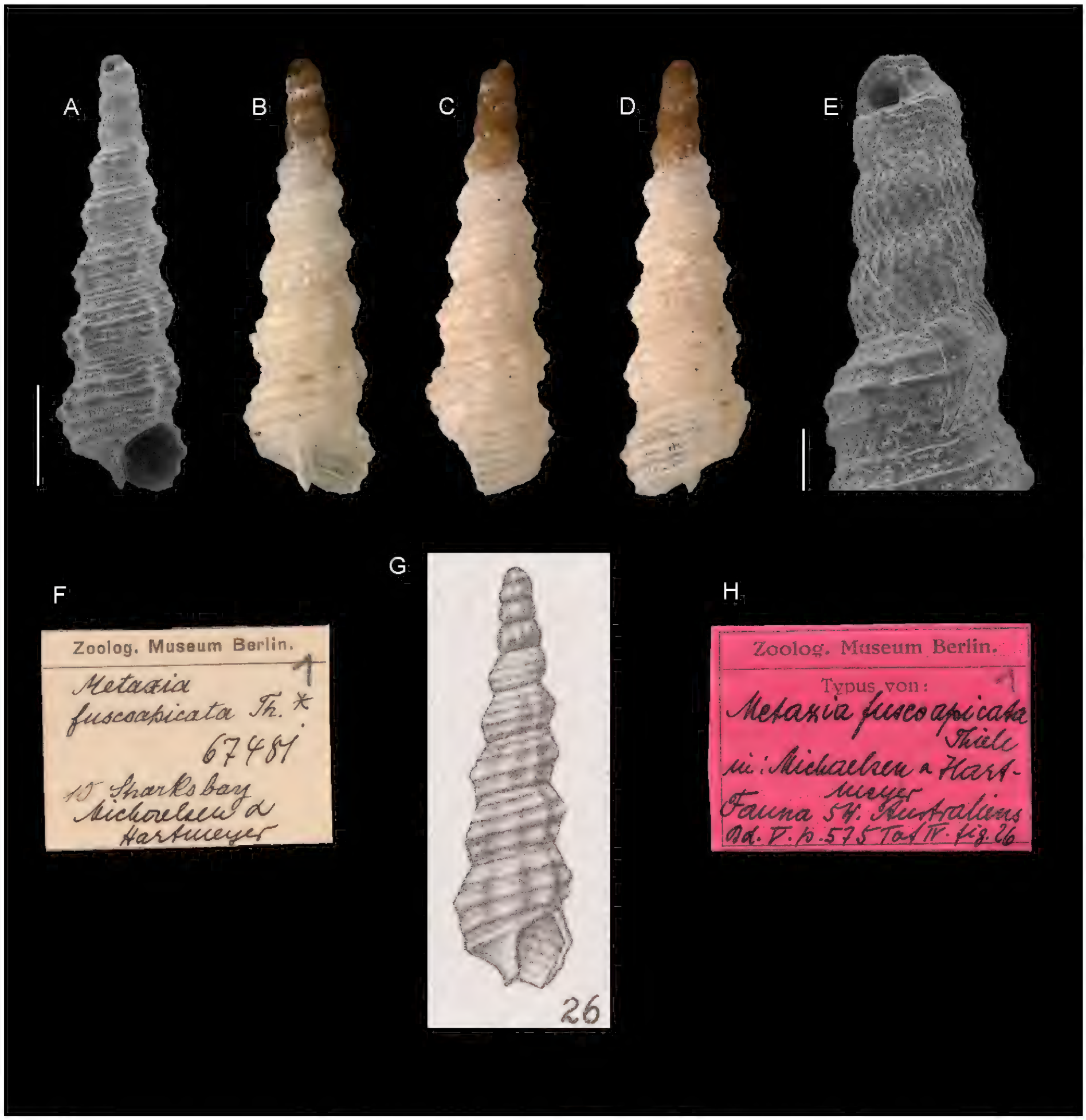

Figure 23. *Metaxia fuscoapicata* Thiele, 1930. **A-E**. Holotype, Station 10 (Shark Bay), ZMB/Moll no. 67481: front (**A-B**), side (**C**), back (**D**), apex (**E**). **F**. Original illustration. **G-H**. Original labels. Scale bar: **A-D**: 1 mm, **E**: 0.1 mm.

axial ribs and three main flat spiral cords; the last two whorls have a sub- and supra-sutural cord. The whorl profile is angulated due to the prominence of the cord in the middle of the whorl. Protoconch multispiral, composed of at least four whorls (but holotype apex is damaged), with zigzag threads on the first and second whorl, followed by axial riblets. Protoconch brown, teleoconch white with occasional tiny faint brown patches on spiral cords between axial ribs.

Remarks. Although the examined type specimen is likely a sub-adult, the specimen identified as *Metaxia fuscoapicata* illustrated by Marshall (1983, figure 9 A-C) may not actually be this species: the holotype has much more convex teleoconch whorls (although juvenile), a lower number of axial ribs, a less angulated protoconch periphery and the zig-zag threads still clearly visible on the second protoconch whorl. More adult and complete specimens from the type locality would be needed to better define this taxon and discriminate it from closely related ones.

Triphora ignobilis Thiele, 1925

Figure 24
Triphora ignobilis Thiele, 1925: 131 (97), plate XXII (X), figures 26 and 26a.

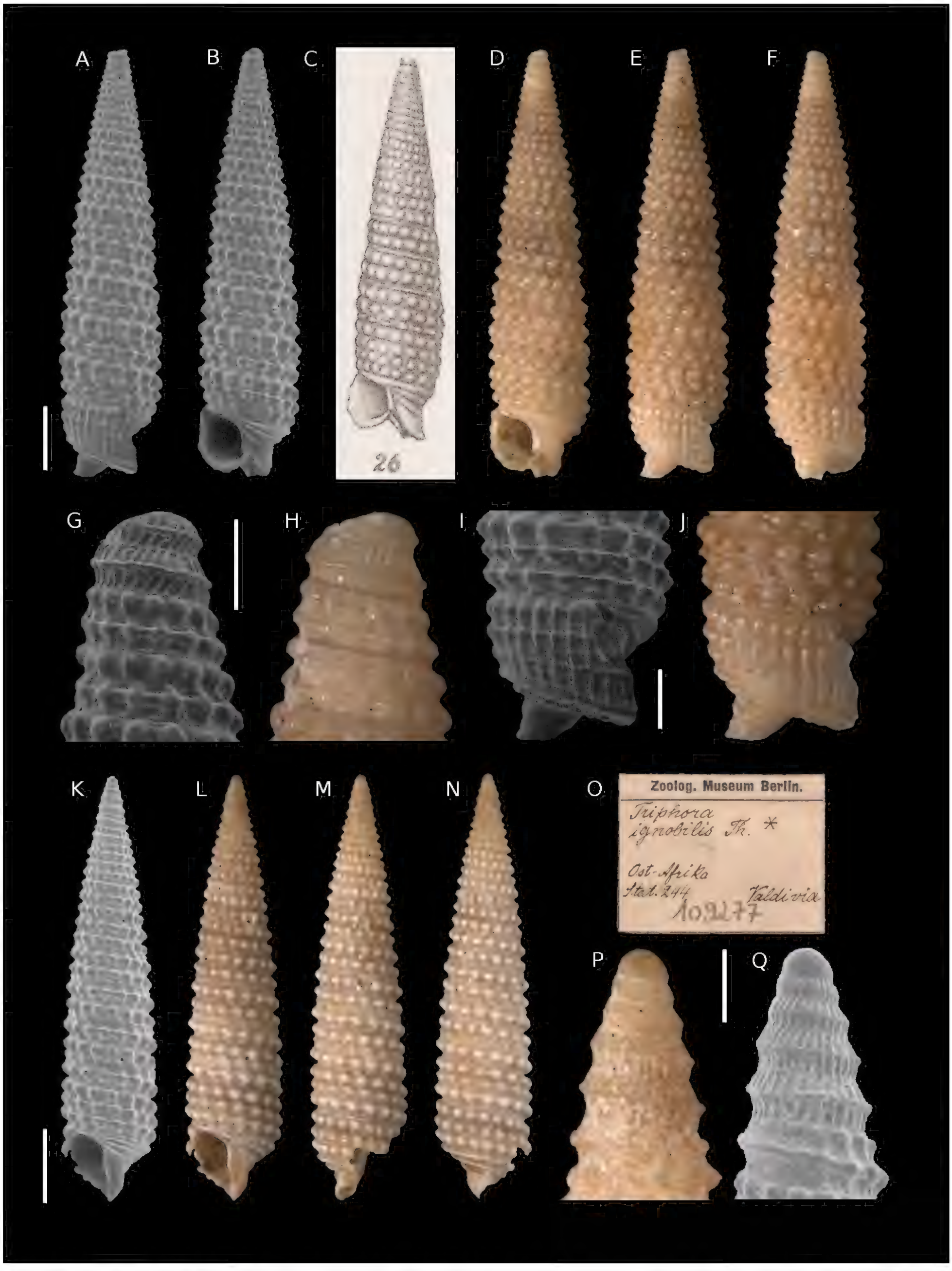

Figure 24. *Triforis ignobilis* Thiele, 1925, Station 244 (5°55.8'S, 39°1.2'E, 50 m depth, off East Africa). **A-B**, **D-J**. Lectotype, ZMB/Moll no. 109277: side (**A, E**), front (**B, D**), back (**F**), protoconch (**G-H**), peristome (**I-J**). **C**. Original figure in Thiele 1925. **K-N**, **P-Q**. Paralectotype, ZMB/Moll no. 109277: front (**K-L**), side (M), back (**N**), protoconch (**P-Q**). **O**. Original label in Thiele 1925. Scale bar: **A-B**, **D-F**: 1 mm, **G-H**: 0.3 mm, **I-J**: 0.5 mm, **K-N**: 1 mm, **P-Q**: 0.2 mm.

Type specimens. Lectotype: ZMB/Moll no. 109277a, here designated. Paralectotypes A-C: ZMB/Moll no. 109277b-d.

Type locality. "Station 244 [5°55.8' südl. Br., 39°1.2' östl. L., 50 m Tiefe, bei Ost-afrika]" (off Zanzibar, East Africa).

Original description. *Vier Schalen von derselben Station 244, die eine gelbbraune Färbung zeigen, scheinen zu keiner bekannten Art zu gehören, sie haben eine gewisse Aehnlichkeit mit* T. perversa, *sind aber bedeutend kleiner. Die abgebildete Schale, der die äußerste Spitze (etwa 2 Windungen) fehlt, zeigt 15 Windungen, sie ist etwas spindelförmig, oben spitz; die Anfangswindungen (nach einer anderen Schale 4-5) haben einen Mittelkiel und herablaufende Fäden, die folgenden haben 2 Reihen rundlicher Knoten, zwischen denen sich ein Faden einschiebt, der sich erst ziemlich weit abwärts zu größeren Knoten umbildet, letzte Windung etwas schmaler als die vorletzte, an der ziemlich stumpfen unteren Kante mit einem Reifen und 2 anderen darunter. Spindelfortsatz schräg gerichtet, Mündung rundlich gegen den Kanal fast geschlossen, Mundrand oben zurücktretend. Höhe 7 mm, Durchmesser 1,5 mm.*

Translation. Four shells from the same station 244, yellow-brown of colour; it seems that they do not belong to an already described species, they show some similarity with *T. perversa*, but are definitely smaller. The figured shell lacks the top of the apex (approximately two whorls), it has 15 whorls, it is slender and the top is pointy; the first whorls (4-5 according to other shells) have a single keel in the middle of the whorl and axial riblets, the following whorls have two rows of tubercles, between them a third fine row develops which bears larger tubercles only on the last few whorls; the last whorl is a bit slender than the penultimate whorl, it has a blunt edge with a spiral cord and two spiral cords underneath. The siphonal canal is oblique, the aperture is rounded and the siphonal canal is narrow, there is an ample posterior canal. Height 7 mm, diameter 1.5 mm.

Diagnosis. Lectotype height 6.7 mm. Shell slender, with flat sides. Teleoconch of 13 whorls, which have two main tubercled spiral cords. Among them, a further cord develops along the spire: it is visible as a simple thread at mid shell height, and becomes a full sized tubercled cord only on the last whorl. A fine suprasutural smooth cord is also present. The last whorl has a fourth weakly tubercled spiral cord, and the base two further almost smooth cords. The peristome shows a well-developed posterior sinus and additional spiral cords between the main ones. The protoconch has five whorls; the first whorl appears smooth, the other whorls have a single strong keel and axial riblets. Background colour light brown with yellowish tubercles and brown interspaces. Both available specimens were, however, dead collected and colours may have faded.

Triforis regia Thiele, 1925

Figure 25
Triphora regia Thiele, 1925: 130 (96), plate XXII (X), figure 23.

Type specimens. Lectotype: ZMB/Moll no. 109274a, here designated. Paralectotype A: ZMB/Moll no. 109274b.

Type locality. "Station 245 (5°27,9' südl. Br., 39°18,8' östl. L., 463 m Tiefe, im Sansibar-Kanal)", [Zanzibar Channel, East Africa].

Original description. *Zwei Schalen von Station 245 (5°27,9' südl. Br., 39°18,8' östl. L., 463 m Tiefe, im Sansibar-Kanal) zeigen ähnlich wie* Argyropeza divina *einen starken Glanz in Verbindung mit einer gelblichweißen Färbung, die Spitze ist braun, aber unvollständig erhalten, mit herablaufenden Fäden und 2 Spiralreifen fein skulptiert; die eine Schale hat 19 Windungen, von denen noch 2 zum braunen Teil gehören, sie ist schlank getürmt, mit geraden Seiten. Die Skulptur besteht aus 3 ungleich starken Knotenreihen, die oberste ist am schwächsten, die unterste am stärksten, die Knoten liegen schräg übereinander und sind etwas von oben zusammengedrückt; auf der letzten Windung werden die Knoten schwächer und zwischen der 2. und 3. Reihe schiebt sich eine schwache ein. Der glatte Reifen der letzten Windung bildet eine starke Kante, unter der ein deutlicher und ein undeutlicher Reifen sichtbar sind. Spindelfortsatz gebogen, Mundrand vorgezogen, unten ein fast geschlossenes kurzes Rohr bildend. Höhe 11 mm, Durchmesser 2 mm.*

Translation. Two shells from station 245 (5°27.9'S, 39°18.8'E, 463 m depth, in Zanzibar Channel) show similarities with *Argyropeza divina* due to its glossy appearance and yellowish/white colouring; the protoconch is brown, but incomplete, sculptured with two spiral keels and axial riblets; one shell has up to 19 whorls, of which two belongs to the protoconch, slender, with flat whorls. The teleoconch is sculptured with three rows of tubercles of unequal strength, the first row is the least pronounced, the third row is the most pronounced, the tubercles lay diagonally one above the other and are slightly compressed on the upper side, on the last whorl the tubercles become less pronounced and a fourth row develops between the second and the third row. The smooth spiral cord on the last whorl forms a strong angle, under which a well developed and an underdeveloped cord are visible. The siphonal canal is curved, the peristome expanded, under which a short siphonal canal is present. Height 11 mm, diameter 2 mm.

Diagnosis. Lectotype height 10.3 mm. Shell very slender and pointed. Teleoconch of 17 whorls, which have two spiral cords with pointed tubercles. A subsutural weakly tubercled spiral cord is present, while a fine suprasutural smooth cord is present, but poorly visible. The last whorl has a fourth smooth strong cord, and the base is smooth. The peristome has additional weakly tubercled spiral cords. Apex in

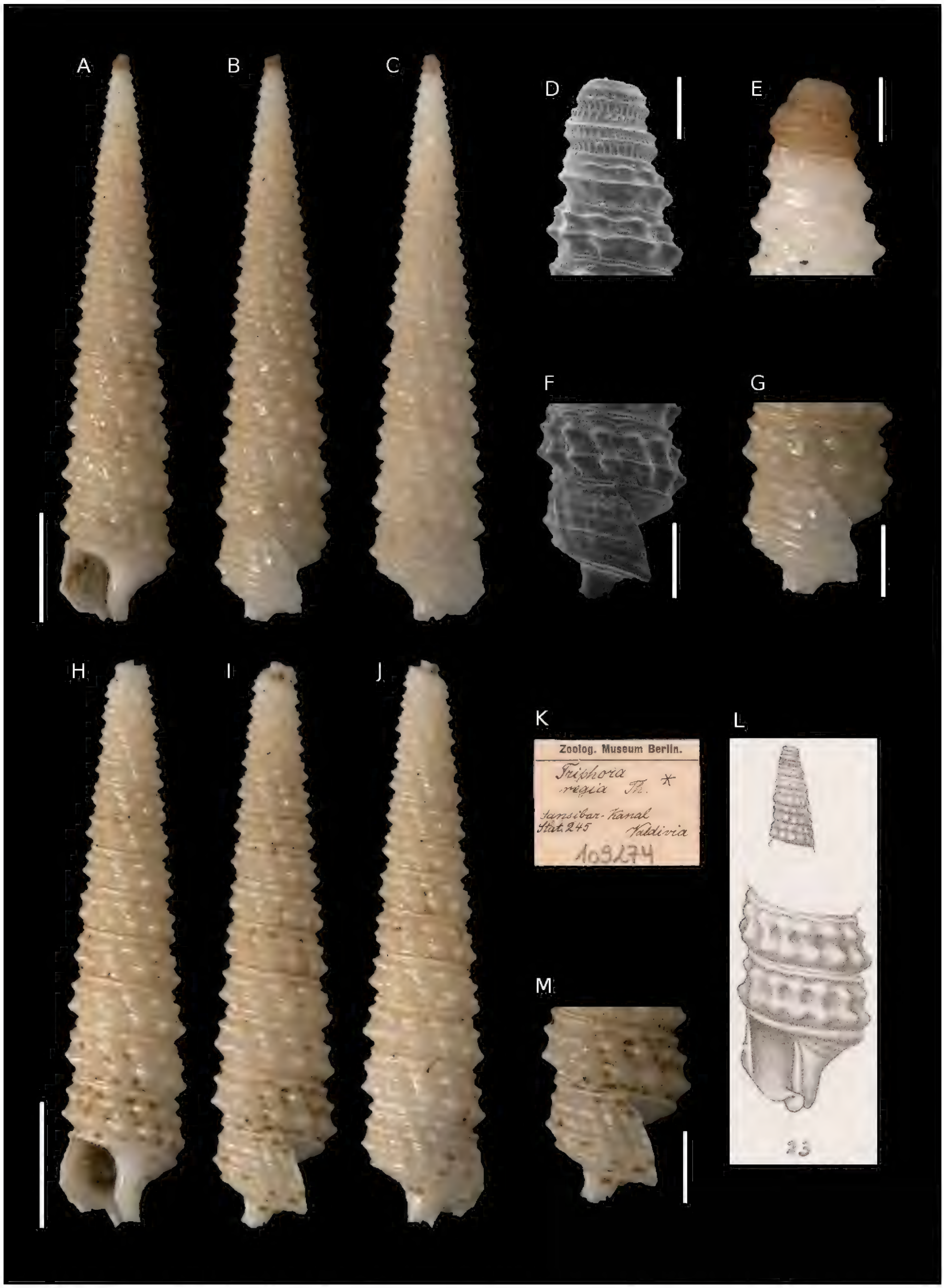

Figure 25. *Triforis regia* Thiele, 1925, Station 245 (5°27.9'S, 39°18.8'E, 463 m depth, in Zanzibar Canal). **A-G**. Lectotype, ZMB/Moll no. 109274a: front (**A**), left side (**B**), back (**C**), protoconch (**D-E**), peristome (**F-G**). **L**. Original figure in Thiele 1925. **H-J**, **M**, Paralectotype A, ZMB/Moll no. 109274b: front (**H**), left side (**I**), back (**J**), peristome (**M**). **K**. Original label. Scale bar: **A-C**: 2 mm, **D-E**: 0.25 mm, **F-G**: 1 mm, **H-J**, 2 mm, **M**, 1 mm.

the lectotype incomplete, but protoconch clearly multispiral. The two whorls which are present have two strong keels and axial riblets. Teleoconch colour light yellowish, with the very first whorls pure white; protoconch brown.

Remarks. It can be easily distinguished from the following *T. sceptrum* because of the multispiral protoconch.

Triphora sceptrum Thiele, 1925

Figure 26
Triphora sceptrum Thiele, 1925: 130-131 (96-97), plate XXII (X), figures 24 and 24a.

Type specimens. Lectotype: ZMB/Moll no. 109275, here designated. Paralectotypes A-B: ZMB/Moll no. 109275b-c.

Type locality. "Station 242 (6°34,8' südl. Br., 39°35,5' östl. L., 404 m Tiefe, bei Daressalam)" [Dar es Salaam, Tanzania].

Original description. *Drei Schalen von Station 242 (6°34,8' südl. Br., 39°35,5' östl. L., 404 m Tiefe, bei Daressalam) haben sehr ähnliche Skulptur, wie die vorige Art [*Triphora regia*], von der sie sich indessen durch das Fehlen des eigentümlichen Glanzes, etwas breitere Form und hauptsächlich durch ganz verschiedene Beschaffenheit der Anfangswindungen unterscheiden. Die größte Schale besteht aus 20 langsam zunehmenden Windungen, die ersten sind wie die übrige Schale weiß, etwas glänzend, zuerst ziemlich groß und rundlich, dann gekielt, ohne oberflächliche Skulptur, die weiteren Windungen zeigen einen etwas welligen Reifen unter der Naht und 2 Reihen starker Knoten, die schräg herablaufenden Falten entsprechen; auf der Rückseite der letzten Windung gehen diese beiden Knotenreihen in einfache Reifen über und unter jeder schiebt sich noch ein Reifen ein, die untere Kante wird durch einen glatten Reifen bezeichnet, unter dem noch ein weiterer sichtbar ist. Spindelfortsatz ziemlich stark gekrümmt, Mundrand oben zurück, unten vortretend, Kanal nicht abgeschlossen. Höhe 13 mm, Durchmesser 2,5 mm.*

Translation. Three shells from station 242 (6°34.8'S, 39°35.5'E, 404 m depth, off Dar es Salaam) have a sculpture very similar to the previous species [*Triphora regia*], from which it is distinguishable by the absence of its peculiar glossiness, its slightly wider shape and mainly because of the different protoconch. The biggest shell has 20 whorls, which slowly increase in size, the first whorls are white like the rest of the shell, a bit shiny; the first whorl of the protoconch is large and rounded, the following whorls have a spiral keel, without any other sculpture; the teleoconch whorls have one spiral cord under the suture and 2 more rows of tubercles, which lie on prosocline axial ribs; on the back of the last whorl there is an additional spiral cord above and below each of the two main rows of tubercles, the lowest cord becomes smooth and forms an angle with the base, and a further cord is visible below this. The siphonal canal is quite strongly curved, the upper part of the aperture has a sinus, and the peristome protrudes significantly, the siphonal canal is not closed. Height 13 mm, diameter 2.5 mm.

Diagnosis. Lectotype height 12.7 mm. Shell very slender, conical, with slightly rounded whorls. Teleoconch of 17 whorls, which have three tubercled spiral cords well visible since the very first teleoconch whorls. A very fine suprasutural smooth cord is also present. The last whorl has a fourth smooth cord, the base has a further fine smooth cord. On the last whorl a further almost smooth spiral cord is present between the second and the third. An ample posterior siphonal canal is present. The protoconch is paucispiral and composed of three whorls: the first is smooth, while the other two have a single prominent spiral keel. Colour white.

Remarks. It can be easily distinguished from the previous *T. regia* because of the paucispiral protoconch.

Triphora subulata Thiele, 1930

Figure 27
Triphora subulata Thiele, 1930: 577, plate IV, figure 34.

Type specimens. Lectotype ZMB/Moll no. 67489a from Station 3, here designated. Paralectotype A: ZMB/Moll no. 67489b; further 16 paralectotypes (ZMB/Moll no. 67489).

Type locality. "Sharks Bay, Stations 1, 3, 9, 12, 14, 16 und 20" [Western Australia].

Original description. *Einige Schalen aus der Sharks Bay (Station 1, 3, 9, 12, 14, 16 und 20) sind sehr spitz, mit etwa 16 sehr langsam zunehmenden Windungen, braun, auf den mittleren Windungen mit 2 Reihen starker, hellerer Perlknoten, zwischen denen sich auf der vorletzten Windung noch eine Reihe einschiebt, an der Unterseite der Endwindung sind 3 glatte Reifen vorhanden. Höhe der abgebildeten Schale 6,5 mm, Durchmesser 1,5 mm.*

Translation. Several shells from Shark Bay (stations 1, 3, 9, 12, 14, 16 and 20) are very pointy, with about 16 whorls which slowly increase in size, brown; on the middle whorls there are two rows of tubercles, light grey in colour; on the last whorls another row of tubercles develops between the first two, on the base three smooth threads are visible. Height of the figured shell 6.5 mm, diameter 1.5 mm.

Diagnosis. Lectotype height 4.2 mm. Shell conical and quite slender. Teleoconch of 10 whorls, which have two main tubercled spiral cords. Between them, a third cord is visible as a fine thread at mid height, and then it develops into a spiral cord only on the last whorl. A very

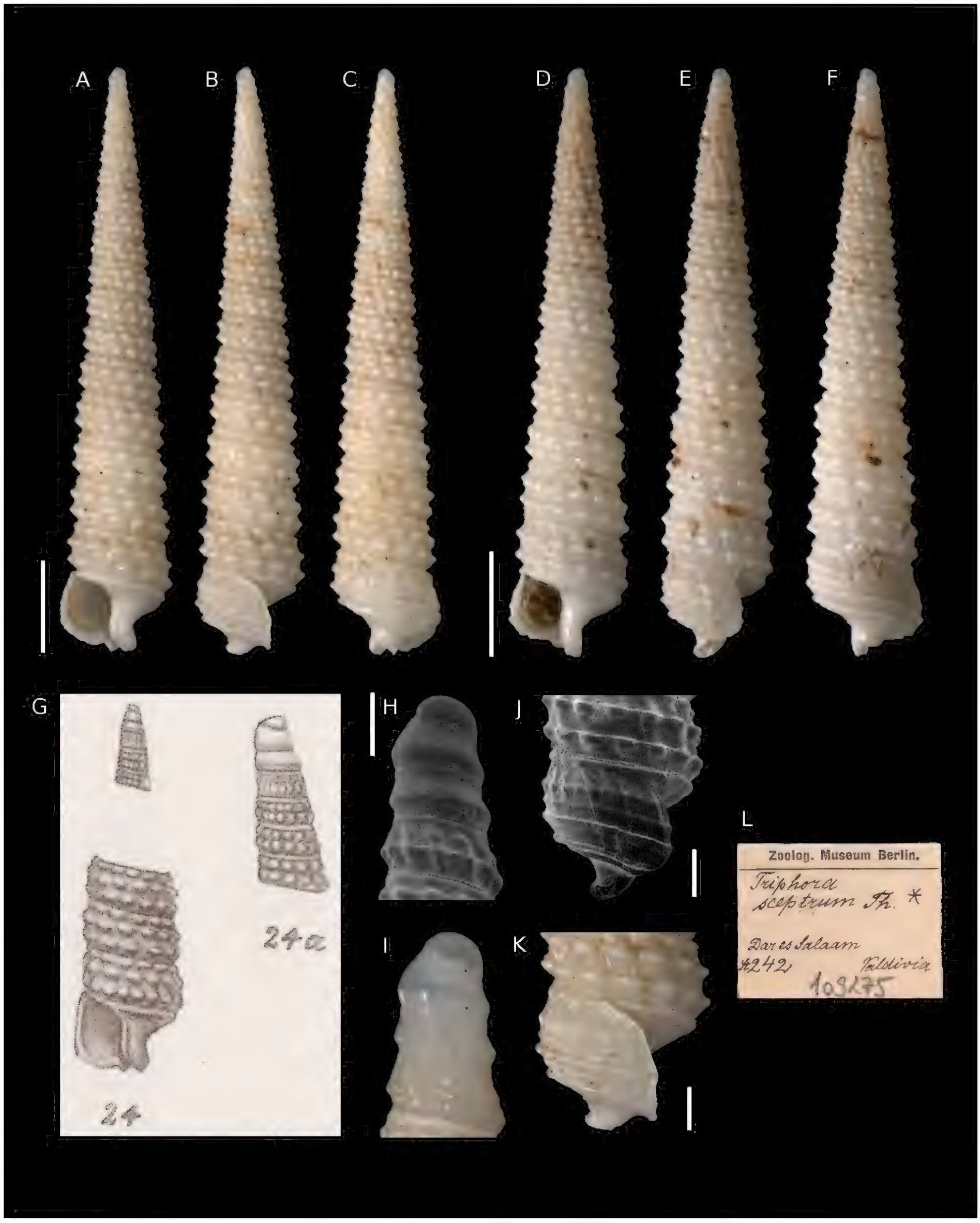

Figure 26. *Triforis sceptrum* Thiele, 1925, Station 242 (6°34.8'S, 39°35.5'E, 404 m depth, off Dar es Salaam). **A-C**, **H-K**. Lectotype, ZMB/Moll no. 109275a: front (**A**), left side (**B**), back (**C**), protoconch (**H-I**), peristome (**J-K**). **D-F**. Paralectotype A, ZMB/Moll no. 109275b: front (**D**), left side (**E**), back (**F**). **G**. Original figure in Thiele 1925. **L**. Original label. Scale bar: **A-F**: 2 mm, **H-I**: 0.3 mm, **J-K**: 0.6 mm.

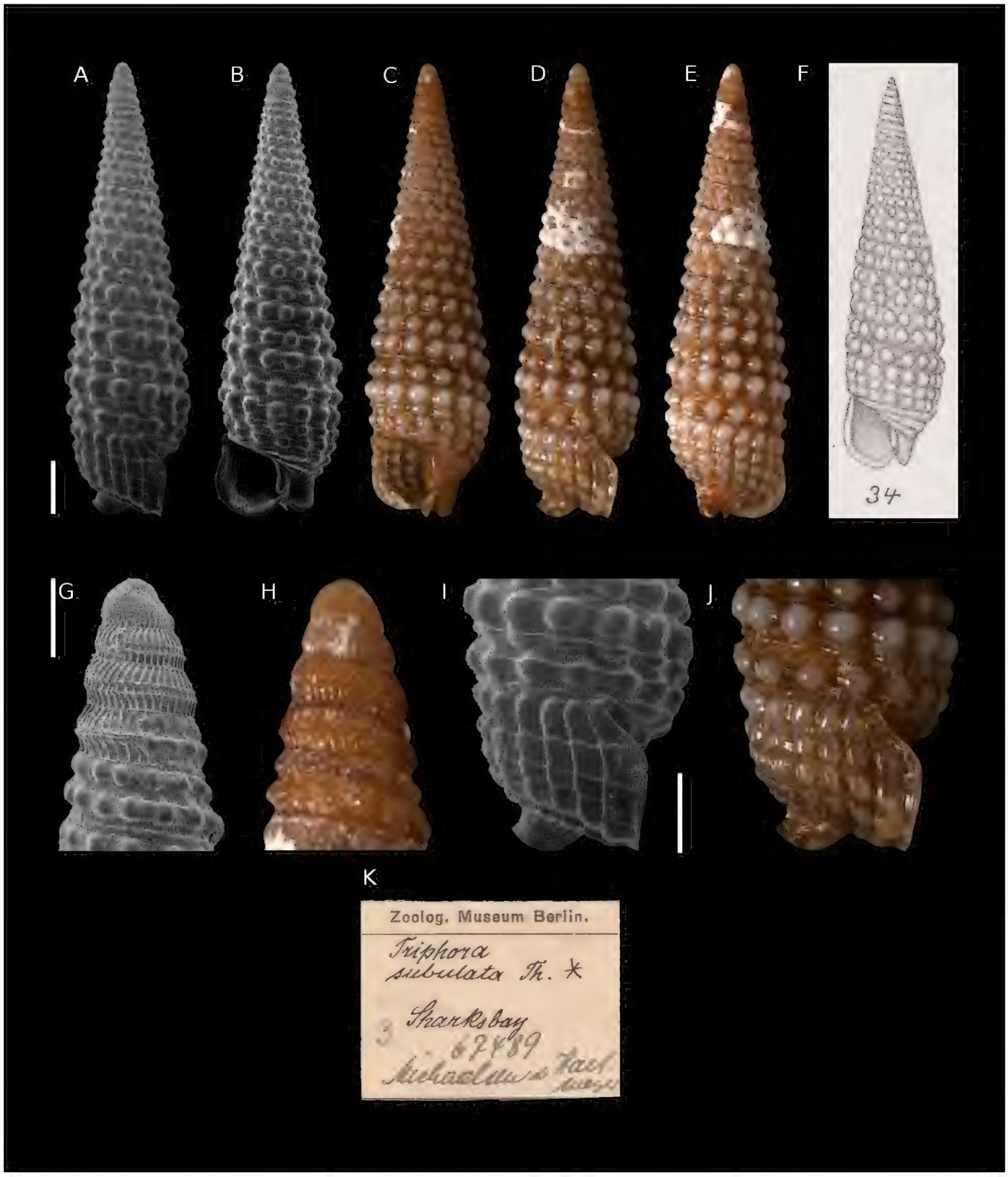

Figure 27. *Triphora subulata* Thiele, 1930, Stations 1, 3, 9, 12, 14, 16 and 20 (Shark Bay). **A-E, G-J**. Lectotype, ZMB/Moll no. 67489a: left side (**A, D**), front (**B-C**), back (**E**), protoconch (**G-H**), peristome (**I-J**). **F**. Original figure in Thiele 1930. **K**. Original label. Scale bar: **A-E**: 0.5 mm, **G-H**: 0.2 mm, **I-J**: 0.4 mm.

fine suprasutural cord is present, but barely visible. The last whorl has a fourth tubercled spiral cord, and the base has a single smooth cord. The peristome has a posterior siphonal canal. The protoconch is composed of five whorls: the first two whorls have granules and tiny axial threads near the suture, the other whorls have two spiral keels and axial riblets. Colour brown with grey granules.

Remarks. No specimens of 6.5 mm height were found, notwithstanding it is stated that the illustrated specimen is this size. The only specimen of comparable size is a subadult (hence not the illustrated specimen) (here selected as paralectotype B), while the lectotype and the other adult specimens range around 4 mm.

Triforis tricincta Dunker, 1882

(new name for *Triforis cingulata* Dunker, 1860)

Figure 28

Triforis cingulata Dunker, 1860: 236; figured in Dunker 1861: 10, tab. 2, figure 1.

Triforis tricincta Dunker, 1882: 109.

Type specimens. Holotype SMF no. 304813 (designated by Janssen, 1993).

Type locality. Japan.

Original description. *T. testa turrita, unicolore fusca, anfractibus planis 14 (usque ad 16?) costulis duabus crassioribus et una tenuiore intermedia cinctis, interstitiis clathratis; basi planata; peristomate subquadrato; rostro brevi. – Alt. 9, lat. 2½ mill.*

Diese Art ist durch ihre Skulptur ausgezeichnet. Die Windungen sind von zwei stumpfen glatten Kielen oder Rippchen umgeben, in dem Zwischenraum aber befinden sich zarte erhabene Längsstrichelchen, die von einer feinen Querlinie durchschnitten werden, wodurch eine gegitterte Oberfläche entsteht. Die Naht ist deutlich.

Translation. Slender shell, of brown uniform colour. Fourteen flat whorls (to 16?) with two large cords and a fine further cord in the middle, space between cords with a cancellate sculpture. Flat base [but it refers to a subadult specimen, illustrated in 1861], subquadrate peristome [again may be due to the description of a subadult specimen], short siphonal canal. Height 9, width 2.5 mm.

This species is characterized by its sculpture. The whorls bear two blunt smooth cords, between them there are longitudinal riblets, which are intersected by a fine thread, creating a cancellate sculpture. A clear suture is visible.

Diagnosis. Large and slender shell, the illustrated specimen (Fig. 28 A-C) is 11.6 mm. Teleoconch of 15 whorls, which have three smooth spiral cords; the second is thinner than the other two. A fine suprasutural smooth cord is also present. The last whorl has a fourth smooth cord, the base has a fifth smooth cord. On the peristome, an additional spiral cord develops between the second and the third. A large posterior notch is present. The apex is not present in the holotype (Janssen 1993) nor in the Japanese specimens preserved in Berlin. The specimen from Dutch Bay (Sri Lanka) has a worn apex, but it can be recognized to have several whorls (multispiral protoconch), probably with two spiral keels and axial riblets. Colour brown.

Remarks. This species was first described by Dunker in 1860 as *T. cingulata*. In 1882, Dunker introduced the new name *T. tricincta*; although he did not specify the reason, *T. cingulata* was indeed a preoccupied name by *Triphoris cingulatus* A. Adams, 1854. The holotype preserved in the Senckenberg Museum is a worn subadult specimen, lacking apex and with a very worn sculpture (Janssen 1993).

The collection in Berlin hosts four lots labelled as *T. cingulata* or *T. tricincta*: three coming from Japan (Enosima, Sakura) and one from Dutch Bay (Sri Lanka). All Japanese specimens are in poor condition, but the specimens from Dutch Bay are quite nice and deserved illustration to better depict the diagnostic characters of this species.

Triphora tubifera Thiele, 1925

Figure 29

Triphora tubifera Thiele, 1925: 132 (98), plate XXII (X), figures 28 and 28a.

Type specimens. Lectotype: ZMB/Moll no. 109266, here designated.

Type locality. "Station 193 (0°30,2' nördl. Br., 97°59,7' östl. L., 132 m Tiefe, im Nias-Süd-Kanal)" [West Sumatra, Indonesia].

Original description. *Zwei Schalen von Station 193 (0°30,2'nördl. Br., 97°59,7'östl. L., 132 m Tiefe, im Nias-Süd-Kanal), von denen die eine nicht ganz ausgewachsen, die andere etwas abgerollt und ohne Spitze ist, gehören zu einer Art mit einem Rohr, das von der Rückseite der letzten Windung abgeht (*Iniforis *Jousseaume); die Art dürfte noch nicht bekannt sein. Die entfärbte Schale ist schlank getürmt, die spitze bräunliche Embryonalschale besteht aus etwa 5 Windungen die mit 2 ziemlich dicht zusammenliegenden Kielen und herablaufenden Fäden skulptiert sind. Die folgenden 12 Windungen zeigen 2 Reihen von Knoten, deren obere unter der undeutlichen Naht gelegene schwächer ist als die untere, sie sind durch Spiralreifen und schräge Falten verbunden, so daß die oberen über den Zwischenräumen der unteren liegen, zu den Rinne zwischen beiden Reihen verläuft ein feiner Spiralfaden. Die letzte Windung bildet unten eine starke durch eine Knotenreihe bezeichnete Kante, unter der am Grunde des unteren schrägen Rohres ein Reifen vorhanden ist; unter dem mäßig langen und ziemlich starken Rohr der Rückseite biegt die mittlere Knotenreihe herum und nähert sich dann dem Oberrande, während eine schwächere sie auf der Mitte fortsetzt. Mündung klein und rundlich, gegen den Kanal ganz geschlossen. Höhe (mit embryonalschale ohne unteren Fortsatz) etwa 4,5 mm, Durchmesser 1 mm.*

Translation. Two shells from station 193 (0°30.2' N, 97°59.7'E, 132 m depth, in the canal south of Nias Island, Sumatra), of which one is not fully grown, the other one very worn and lacks the apex; they belong to a species with a tube protruding from the back of the last whorl (*Iniforis* Jousseaume); this species seems not to be known yet. The faded shell lacks colour and is slender, the brown pointed protoconch has 5 whorls and is sculptured with two spiral keels and axial riblets. The following 12 whorls have two rows of tubercles, of which the upper one is weaker than the lower one, they are connected by spiral

Figure 28. *Triforis tricincta* Dunker, 1882 (= *T. cingulata* Dunker, 1861). **A-E**. Dutch Bay [Sri Lanka]. ZMB/Moll no. 33066: front (**A**), side (**B**), back (**C**), protoconch (**D**), peristome (**E**). **F-G**. Original labels of *Triforis tricincta*. **H**. Original figure of *Triforis tricincta*, as *Triforis cingulata* in Dunker, 1861. Scale bar: **A-C**: 2 mm, **D**: 0.2 mm, **E**: 1 mm.

threads and diagonal folds, in this way the tubercles of the upper row lies above the interspaces of the lower row, a fine spiral thread is present in the groove between the two rows of tubercles. The last whorl has a strong spiral cord with tubercles which forms an angle at the periphery, on the lower part of the last whorl and under the tube another spiral thread is visible; underneath the long and strong tube on the last whorl, the lower row of tubercles is bended around the tube and then approaches the upper edge of the whorl, in the middle of the peristome a further weak spiral cord is present. The aperture is small and rounded, the siphonal canal is closed. Height (with the protoconch whorls but without the missing lower part) about 4.5 mm, diameter 1 mm."

Diagnosis. Lectotype height 4.1 mm, but lacks the protoconch. Shell conical, with rather flat sides. Teleoconch of ca. 11 whorls, which have two strong tubercled spiral cords; the first cord is weaker than the second. A fine suprasutural smooth cord may be present. The last whorl has a third spiral cord, probably weakly tubercled, but lectotype conditions are too poor to better define this character. The base seems smooth. A strong tubular posterior siphonal canal is present. The peristome seems to host an

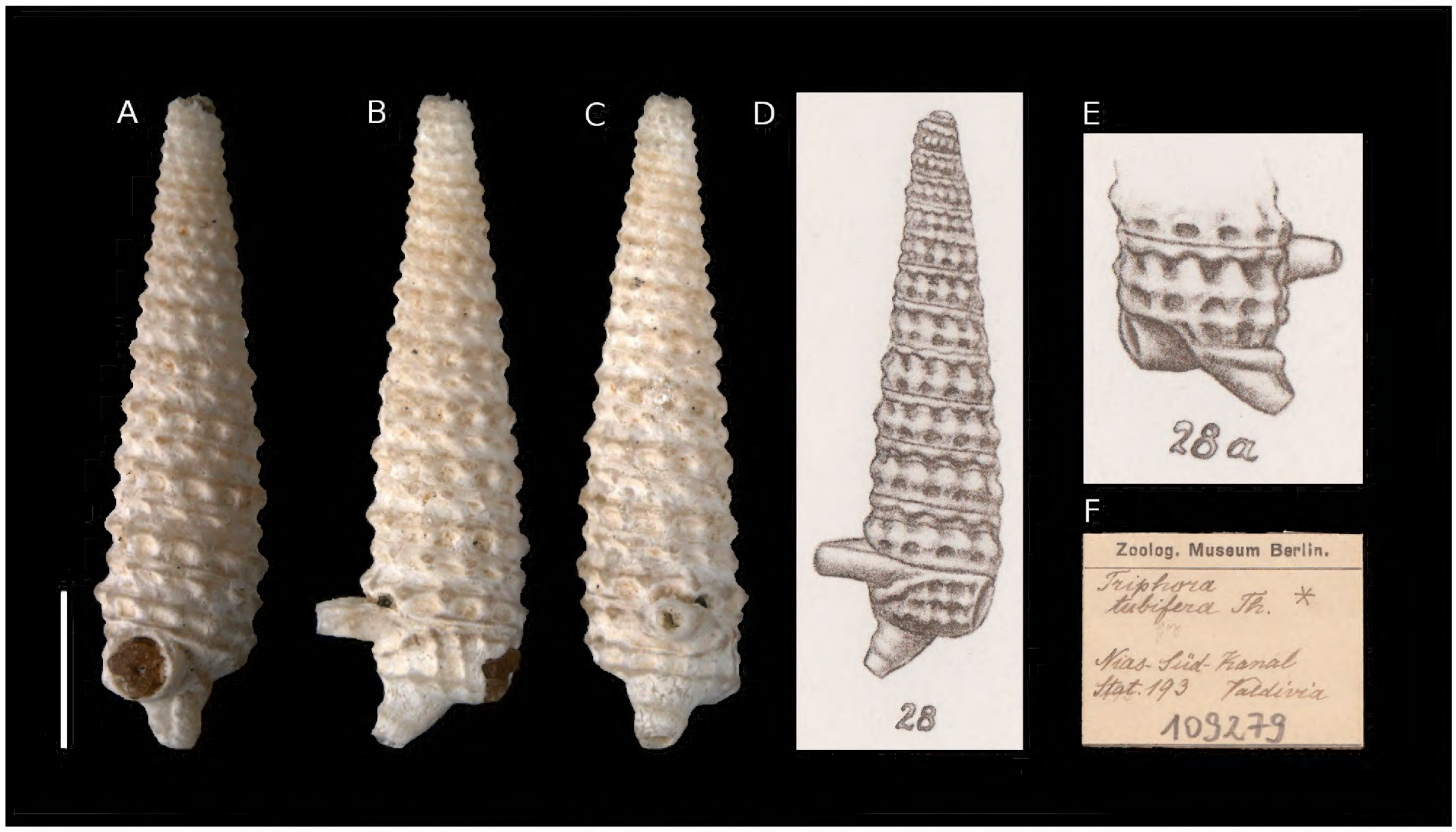

Figure 29. *Triforis tubifera* Thiele, 1925, station 193 (0°30.2' N, 97°59.7'E, 132 m depth, in the canal south of Nias Island, Sumatra, Indonesia). **A-C**. Holotype, ZMB/Moll no. 109279: front (**A**), left side (**B**), back (**C**). **D-E**. Original figures in Thiele 1925. **F**. Original label. Scale bar: **A-C**: 2 mm.

additional cord between the two main ones. According to the original description, the protoconch has five whorls which bear two spiral keels and axial riblets. The colour cannot be described on the basis of the lectotype; the protoconch is described as brown.

Remarks. The juvenile specimen cited in the original description and which probably had a complete protoconch was not found in the Berlin collection. The specimen found is clearly the specimen illustrated by Thiele.

Triphora virginalis Thiele, 1925

Figure 30

Triphora virginalis Thiele, 1925: 304 (270), plate XXII (X), figure 29.

Type specimens. Holotype: ZMB/Moll no. 108518, fixed by monotypy.

Type locality. Padang (Sumatra) [Indonesia].

Original description. *Die einzige weiße Schale scheint zu keiner bekannten Art zu gehören, leider fehlt die Spitze; ein Rest der bräunlichen Embryonalschale zeigt, daß die Windungen einen Mittelkiel und herablaufende Fäden haben. Die folgenden 8 Windungen haben zuerst 2 Knotenreihen, zwischen denen sich dann eine dritte ausbildet, die Knötchen sind rundlich, erhoben, senkrecht übereinander gelegen. Die letzte Windung hat untern 2 deutliche und einen schwächeren Reifen. Spindelfortsatz ziemlich kurz und breit. Die Form der Schal ist walzig kegelförmig, die Windungen bedeutend breiter als hoch, zuletzt kaum zunehmend. Höhe etwa 3,5 mm, Durchmesser 1 mm.*

Translation. The single white shell does not seem to belong to any described species, unfortunately it lacks the top; only a small part of the brown protoconch is visible, the whorl has a single keel and axial riblets. The following 8 whorls have on the upper whorls two rows of tubercles and between them a third appears; the tubercles are rounded, raised, located vertically one above the other. The last whorl has on the underside two conspicuous spiral cords and an obsolete one. Siphonal canal short and wide. The shell has a more or less conical shape, the whorls are considerably wider than high, the last whorl is barely larger in size than the previous one. Height about 3.5 mm, diameter 1 mm.

Diagnosis. Holotype height 3.2 mm. Shell conical with flat sides. Teleoconch of seven whorls, which have three tubercled spiral cords. The first two are well visible since the first teleoconch whorl, while a third appears later between the two main cords: it is initially a fine thread on the third whorl, and is fully developed on fifth whorl. The last whorl has a fourth weakly tubercled spiral cord, and the base has two further smooth cords. Only the last whorl of the protoconch is present in the holotype, but it is clearly multispiral and bears a single spiral keel and several axial riblets. Colour white, the visible protoconch whorl is light brown.

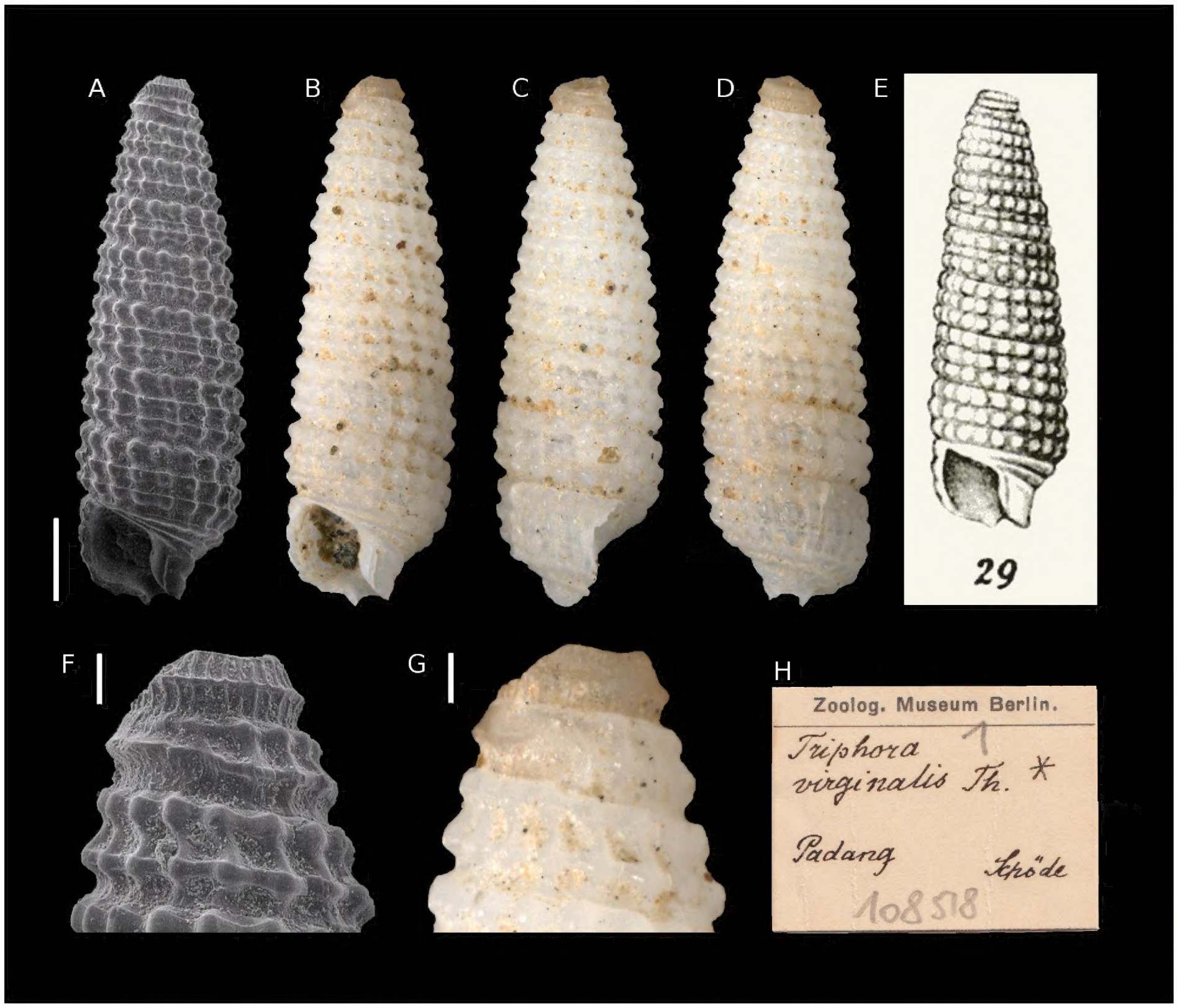

Figure 30. *Triforis virginalis* Thiele, 1930, Padang (Sumatra). **A-D**, **F-G**. Holotype, ZMB/Moll no. 108518: front (**A-B**), left side (**C**), back (**D**), protoconch (**F-G**). **E**. Original figure in Thiele 1930. **H**. Original label. Scale bar: **A-D**: 0.5 mm, **F-G**: 0.1 mm.

Antarctic species

***Triforis delicatula* Thiele, 1912**

Figure 31
Triforis delicatula Thiele, 1912: 205-206, plate 12, figure 30.

Type specimens. Two specimens are present in the ZMB/Moll (no. 63006), but do not correspond to the original description and figure. We refrain at this stage from selecting any lectotypes.

Type locality. Antarctica, Gauss Station [Davis Sea, 66°02'09"S - 89°38'05"E, -385 m; fide Engl (2012)].

Original description. *Die einzige Schale von der Gauss-Station (Fig. 30) ist 4,5 mm hoch und 1,25 mm breit, aus 11 Windungen gebildet, die ziemlich schwach gewölbt sind und eine flache Naht zeigen. Sie sind mit schmalen, etwas schrägen Fältchen skulptiert und zeigen etwas unter der Mitte einen Kiel, der besonders auf den unteren Windungen nach oben steiler abfällt, als nach unten; darüber weisen die unteren Windungen noch drei erhabene Spirallinien auf, durch welche die Längsfältchen knotig erscheinen. Unmittelbar über der Naht ist noch eine einfache, nicht knotige Spirallinie sichtbar und an der Unterseite der letzten Windung noch eine ähnliche. Der Spindelfortsatz ist kurz und deutlich gedreht, an dem Exemplar ebenso wie der Unterrand der Mündung etwas beschädigt.*

Translation. The only shell comes from the Gauss Station and is 4.5 mm high and 1.25 mm broad. It has 11 whorls, weakly rounded and shows a flat suture. They are sculptured by thin axial ribs and have a keel on the lower part of the whorl, which is especially prominent on the lower whorls. Moreover, the lower whorls have further three spiral cords, which show tubercles at the intersection with axial ribs. Immediately above the suture a simple smooth cord is visible. Also the base has another smooth cord. The columella is short and clearly curved, but damaged like the lower part of the aperture.

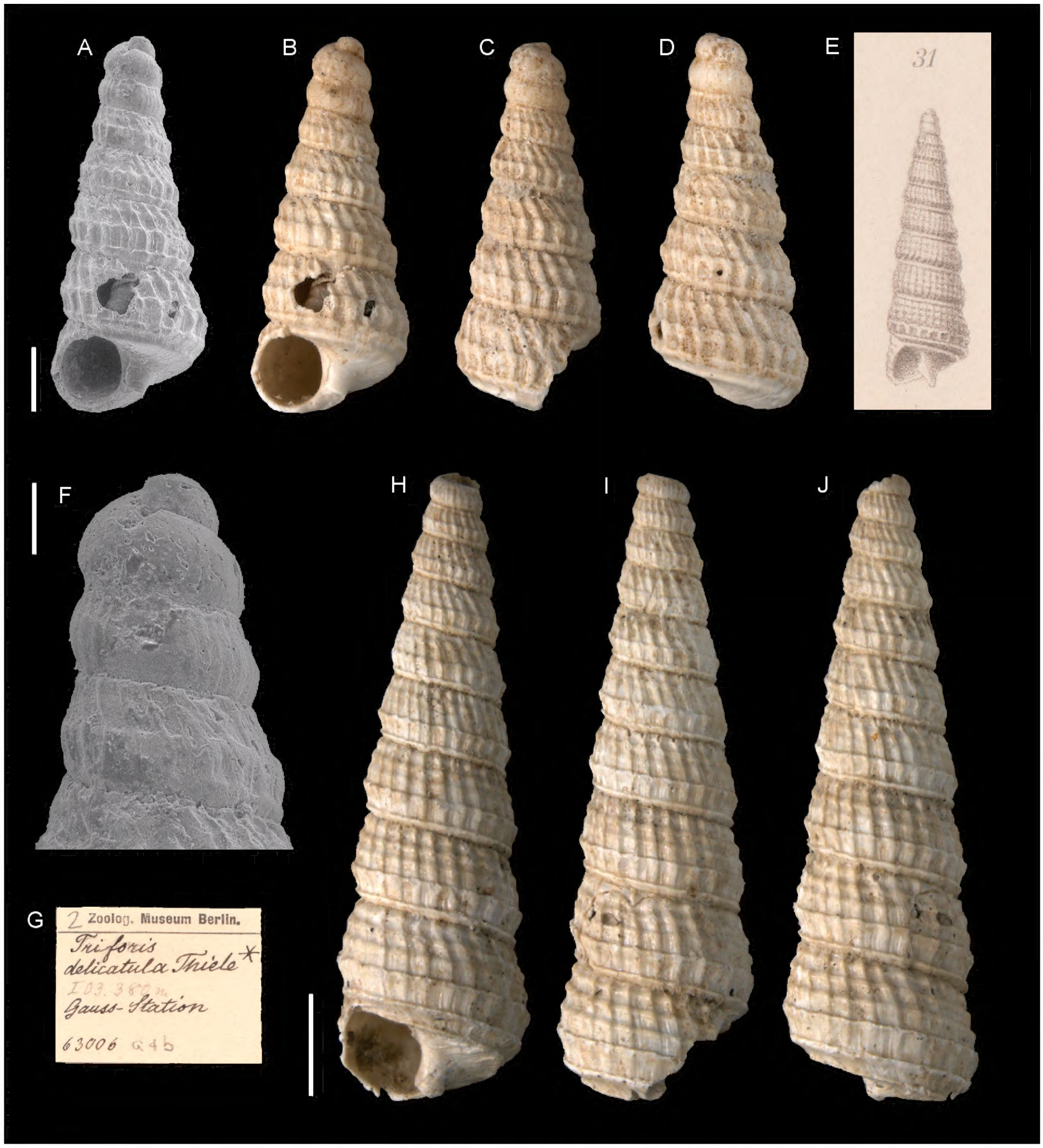

Figure 31. *Triforis delicatula* Thiele, 1912, Antarctica, Gauss Station. **A-D**, **F**. ZMB/Moll no. 63006a: front (**A-B**), left side (**C**), back (**D**), protoconch (**F**). **E**. Original figure in Thiele 1912. **G**. Original label. **H-J**. ZMB/Moll no. 63006b: front (**H**), left side (**I**), back (**J**). Scale bar: **A-D**: 0.5 mm, **F**: 0.2 mm, **H-J**: 1 mm.

Diagnosis. Teleoconch up to eight whorls and 6.1 mm, but possibly slightly more, because the largest available specimen has a complete base but not a complete peristome. A strong adapical spiral cord is present since the early teleoconch whorls and further threads later appear. The sculpture on the lower whorls is composed by four spiral cords and prosocline axial ribs which form tubercles at the intersections; a fifth smooth suprasutural cord is also present. The base has a sixth smooth cord. The paucispiral protoconch, composed by 2.5 whorls, suggests lecitotrophic development. The first whorl appears smooth, and the last whorl has axial riblets and a single spiral keel. However, the condition of the specimen with protoconch is very poor, and finer sculpture, if present, cannot be described. Colour ivory, but both specimens are worn and it is difficult to judge which the original colour was.

Remarks. A single specimen is cited in the original description. However, the lot in the ZMB is composed by two specimens which are different in size (height: 2.9 and

6.1 mm, respectively) than the specimen cited by Thiele (4.5 mm), as already noted by Engl (2012). Also the figure in plate 12 (in Thiele 1912) shows that the available specimens are not the same that Thiele studied: the illustrated specimen has a complete apex and eight whorls, while the smaller specimen in the Museum has a complete protoconch, but just four whorls, while the larger has eight whorls, but no protoconch. Due to these circumstances, these two specimens cannot be considered syntypes, because there is no evidence they were part of the type series that brought to the description of this species.

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